THE BUCKINGHAM-OSBURN SEARCHLIGHT ARITHMETICS

BOOK THREE

BUCKINGHAM-OSBURN

SEARCHLIGHT ARITHMETICS
BOOK THREE

A pupils' book for the fifth and sixth years based, like the preceding books of the series, on the authors' intensive investigation and experimentation.

Unequaled provision is made for practice in the fundamentals. Part of this appears as "Practice Exercises" (pp. 76, 111–113, 131–132, 168, 286–287, 310–311); part is distributed throughout the text. By the unique device of the divided page, first used in this series, this practice material is separated from the development of new work (pp. 53, 169, 265, 359).

A definite technique of teaching problem-solving is adopted. This consists of the recurrent use of "cues" which suggest to the pupil what operation to use. The pupil learns the meaning of the language of the problem. In character these problems attain a new level in their range, interest, and reflection of life situations (pp. 92–94, 107–111, 260–262, 364–367).

Every major procedure is analyzed into units of difficulty. New steps are introduced one at a time, first the simple, then the more complex. Points of difficulty are especially emphasized (pp. 84–85, 90–91, 99–101).

The easier portions of decimal fractions are put in the fifth grade; the more difficult common fractions in the sixth grade.

Definite devices are used to help in the writing of numbers and to prevent errors (pp. 142, 307).

Detailed explanations are given for all new work (pp. 102–105, 129–130, 186, 368–373). These are addressed to the pupil. The vocabulary has been carefully checked against an exhaustive graded word list. Much of the developmental treatment is admirably adapted to silent reading.

Full attention is given to the use of short methods of computation (pp. 320, 333, 352).

The material provided for review is abundant (pp. 203–218, 468–482, and all of Chapter VI).

To provide adequately for individual differences Book Three is accompanied by a pupil's work book with remedial material for slow pupils and challenging material for bright ones. There is also a teacher's manual. In this manual are tests of achievement; in the pupil's book, inventory tests.

Book Three is preceded by Book One for the third grade and Book Two for the fourth grade, with an Introductory Book for teachers covering the work of the first and second grades. Following Book Three, Book Four provides the necessary material for grades seven and eight. A pupil's work book and a teacher's manual accompany each book of the series.

GINN AND COMPANY

BOSTON NEW YORK CHICAGO ATLANTA
DALLAS COLUMBUS SAN FRANCISCO

1195-6, 27

The BUCKINGHAM-OSBURN SEARCHLIGHT ARITHMETICS

BOOK THREE

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GINN AND COMPANY
BOSTON · · NEW YORK · · CHICAGO · · LONDON
ATLANTA · · DALLAS · · COLUMBUS · · SAN FRANCISCO

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PRINTED IN THE UNITED STATES OF AMERICA

427.10

The Athenæum Press
GINN AND COMPANY · PROPRIETORS · BOSTON · U.S.A.

PREFACE

The Searchlight Arithmetics are the result of more than a decade of study. This study has been devoted to the problems involved in teaching arithmetic. The results indicate quite clearly where the trouble is and what should be done about it. The needs are as follows:

1. Adequate provision for the individual differences of children.
2. Sufficient practice upon fundamental combinations and procedures.
3. A technique for teaching problem solving.
4. Organization of subject matter in accordance with the common-sense principle that learning should proceed from simple to complex.
5. Fortification against interference in learning.

Progress in teaching and learning arithmetic will be assured when these five needs are provided for. This is just what the Searchlight Arithmetics guarantee to do when the series is properly used.

Individual differences. The outstanding fact, true in every classroom, is the astonishing magnitude of individual differences. Some of the pupils are always hopelessly confused and some are exceedingly bored. Others are reasonably happy in their work. The present need is obvious. It is twofold in its nature — there must be remedial

material for the slow pupils and challenging material for those who are bored. The Searchlight Arithmetics meet both of these needs in the pupils' workbooks. One of these is available for each grade.

Practice material. In this volume, intended for the fifth and sixth grades, practice in the fundamentals is provided to an extent heretofore unequaled. Each fundamental combination and procedure recurs at least twice a month after it is first introduced. For example, pupils who have had the 225 higher-decade combinations which are prerequisite to column addition will meet each of the 225 at least twice a month throughout the fifth and sixth grades. In like manner they will meet all procedures which are fundamental in character. Part of this material appears as "Practice Exercises." The rest is printed, on divided pages, "below the line."

Problem solving. Most children do not learn to solve problems by transfer from the solution of examples. For them, direct instruction in problem solving is necessary. Problems are of many types and kinds. The old idea was to teach all of them at least once. This was sufficient for the bright child but ruinous for those who were less fortunate. As a result 60 per cent of all errors in problem solving are due to nothing other than an aimless juggling of figures. Children artlessly ask, "Do you add?" The language of the problem has no meaning for them. They fail utterly to "get their cue." This means that we shall have to teach and practice some of the more important cues just as we teach and practice $7 \times 6 = 42$. This is particularly true in denominate numbers. Current practice

has been to give on a single page from five to ten practices on, say, changing feet to inches and a like number on changing bushels to pecks, miles to rods, tons to pounds, inches to feet, ounces to pounds, and so on. Then it has been assumed that these facts will be known forever. Such a procedure is, of course, foredoomed to failure. Children are not built that way. The Searchlight Arithmetics recognize the facts in the case and give recurrent practice on the most important cues. Again and again in the study of these books children will meet with "Find the area," "What is the total?" "What part of —— is ——?" and the like. In this way these books line up with the common-sense principle of teaching first and best what is most important.

From simple to complex. Particular attention has been devoted to the principle of proceeding from simple to complex. Learning arithmetic should be like ascending a well-constructed stairway. New steps or elements should occur one at a time. The risers should be as nearly equal as possible and none of them should be missing. The material of the Searchlight Arithmetics has been carefully organized in accordance with this principle. Particular attention is called to the new steps that have been provided to alleviate the difficulty in two well-known spots. On pages 84–85 and 90–91 of this volume the learner will find 150 fundamental fractional combinations which are prerequisite in the addition of mixed numbers. This list is complete for the denominators that the world uses in common fractions. Children who can respond correctly to these combinations will not make mistakes in the addi-

tion of mixed numbers. In the past the arithmetic stairway had missing steps at this point and there was much difficulty. Now the steps are provided and the difficulty is removed.

Similarly, missing steps have been discovered in the subtraction of mixed numbers and particularly in the subtraction of a mixed number from a whole number. These missing steps are made up of 68 fundamental fractional combinations. They are listed on pages 99 and 100 of this volume.

There is another very important requirement in a stairway. As we ascend, each step must be a step upward. When we start upstairs we do not expect to fall into a chasm or make even one step downward. Teachers have long known that the work of the upper fifth grade is more difficult than that of the lower sixth grade. Indeed, examples like $7\frac{1}{2} + 4\frac{2}{3} + 6\frac{1}{4} = ?$ or $3\frac{1}{3} \times 4\frac{1}{6} \times 2\frac{3}{4} = ?$ are much more difficult than anything that is ever taught in decimal fractions. Children have toiled up a mountain in the fifth grade only to fall into a chasm in the sixth. The Searchlight Arithmetics have provided the obvious remedy. The more difficult common fractions have been postponed until the sixth grade, and the easier portions of decimal fractions have been put in the fifth grade.

Interference in learning. Interference in learning has been prevented in all of its most serious aspects. For example, the notion of the common denominator has been used in the addition and subtraction of decimals. It is unfair to present to children, without warning, examples like $3.2 + 4.125 + 8.07 = ?$ The well-known wrong answer

to this exercise is 4964, obtained by adding as in whole numbers. After insisting for two years on keeping the right-hand margin even, what else can we expect? In like manner, in the example $10 - 6.25 = ?$ the child who gets 615 for an answer is doing pretty much as he has been taught. He puts what seems to be the larger number on top and keeps the right-hand margin even. The Searchlight Arithmetics meet this issue by presenting decimals which have common denominators. In all written work zeros are inserted for the children. The examples just given are made to read $3.200 + 4.125 + 8.070 = ?$ and $10.00 - 6.25 = ?$

Again in the addition and subtraction of common fractions the column form is always used in order to avoid the troublesome tendency to use cancellation after the multiplication of fractions has been taught. Furthermore, in the division of common fractions the inversion of the divisor is avoided by using the common-denominator method. This restores the meaning of division and prevents the inversion of the dividend by mistake.

Distribution of Material

All material which is addressed to the teacher is in the teachers' book. All matter which is addressed to the pupil is in the pupils' book. Two kinds of test material are provided. Tests of achievement are without exception in the teachers' manual, but the inventory tests are in the pupils' books. The distinction between these two types of tests is clear. Inventory tests are to be studied and practiced beforehand, while achievement tests must

not be seen by the pupil ahead of time. Both varieties are necessary. The achievement test is a measure of the general progress of the pupil in the subject as a whole. The inventory test discloses just how much he knows and does not know in some definite field. The achievement test is made up of samples from a very large area. The inventory test includes all the elements in a relatively small area.

Vocabulary. Care has been taken to develop the new work in detail and to do so in language which the child can understand. The vocabulary of the book has been carefully compared with an exhaustive graded word list; and no word occurs which is not, according to respectable evidence, in the vocabulary of the average child, unless the word in question has been defined or otherwise explained.

Silent reading. Much of the developmental treatment is admirably adapted to the uses of silent reading. The presentation of each new topic has been made in a careful manner with many illustrations and in an easy style. The progressive character of this material and its adaptation to the child's ability combine to make many of these sections excellent silent reading lessons.

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BOOK THREE

PART I

CHAPTER I

REVIEW

You are now beginning the work of the fifth grade. The first thing to do is to find out if you have forgotten anything that you learned in the earlier grades. You must be careful about this, because you cannot do the work of the fifth grade well if you have forgotten some of what you learned in Grades I, II, III, and IV. On the next few pages you are to show how well you can add, subtract, multiply, divide, and solve problems. If you make mistakes in any of the tests, ask your teacher to show you why you made the mistake. The first tests are the easiest, but you can make a good score on them all if you are careful. Wouldn't it be splendid if you could be a 100-per-cent pupil on all the tests? A 100-per-cent pupil, you know, gets everything right. See how many times you can make 100 on the tests.

Test I. Addition

Do you remember how to add? If so, you should be able to get the right answers to every one of the following examples. Try to get them all right the first time you work

them. See if you can start with 100 per cent the first day. If you study hard, you can make 100 per cent every day.

Add each of the following pairs of numbers:

	(1)	(2)	(3)	(4)	(5)
(*A*)	243	825	107	310	792
	725	124	692	637	106
(*B*)	381	570	605	531	620
	308	300	380	241	256
(*C*)	460	341	160	431	530
	415	157	501	304	124
(*D*)	240	410	222	461	567
	402	123	310	530	421

Test II. Addition

Find the sums:

	(1)	(2)	(3)	(4)	(5)
(*A*)	766	385	187	835	872
	578	985	824	987	169
(*B*)	887	271	258	526	865
	369	939	868	479	788
(*C*)	484	474	576	768	867
	956	697	775	264	435

Did you have any wrong answers? If so, tell your teacher which examples you got wrong and ask her to tell you what to do.

Test III. Column Addition

In the fifth grade you will often need to add columns of figures. In order to add those columns correctly, you must first make 100 per cent in Tests III, IV, V, and VI. Get the answers to Tests III and IV without pencil and paper.

Finish these exercises in two minutes if you can:

1. Add each of these numbers to 30:

6, 3, 1, 5, 2, 8, 4, 9, 7.

2. Add each of these numbers to 21:

3, 5, 8, 9, 7, 4, 2, 1, 6.

3. Add each of these numbers to 24:

5, 9, 4, 1, 6, 3, 8, 7, 2.

4. Add each of these numbers to 22:

2, 8, 6, 4, 9, 5, 1, 3, 7.

5. Add each of these numbers to 28:

8, 4, 5, 3, 2, 6, 9, 1, 7.

6. Add each of these numbers to 23:

4, 2, 8, 1, 7, 5, 9, 6, 3.

7. Add each of these numbers to 27:

5, 3, 8, 1, 7, 2, 6, 4, 9.

8. Add each of these numbers to 29:

9, 4, 8, 2, 7, 3, 6, 5, 1.

9. Add each of these numbers to 26:

9, 7, 3, 5, 1, 8, 6, 4, 2.

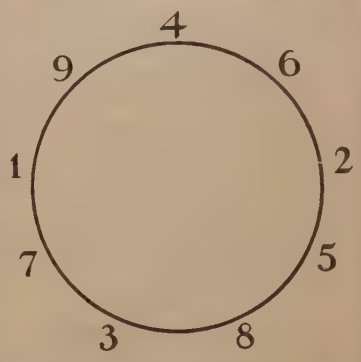
10. Add each of these numbers to 25:

1, 6, 2, 9, 3, 7, 4, 6, 5.

Test IV. A Circle Game

The boys and girls in the Emerson School have learned a new circle game. This is the way they play it.

They all think of some number. Suppose it is 19. Then they add each number on the circle to the 19. They begin by thinking 19 and 4 are 23; 19 and 6 are 25; 19 and 2 are 21. They also know a shorter method, simply saying 23, 25, 21, and so on without using their pencils. They played the game eleven times yesterday. After they had gone all around the circle with 19 they tried with 10, 18, 13, 11, 15, 12, 16, 20, 14, and 17. All but two of the fifth-grade class finished without a mistake. Can you do as well?



Test V. Column Addition

Find the sums:

1	2	3	4	5	6
757	486	253	566		
134	405	327	214	475	357
678	934	242	160	355	756
835	275	369	507	968	321
576	507	754	484	296	798
242	816	136	636	534	679
353	185	860	697	847	443
618	291	948	735	624	202

Test VI. Column Addition

Add the following columns:

1	2	3	4	5	6
894	653	576	968	959	464
219	349	726	423	998	974
450	235	610	921	202	218
786	949	988	197	311	153
819	560	439	544	584	520
200	342	190	548	238	297
358	679	238	187	122	758

Test VII. Subtraction

Do you remember how to subtract? Show how well you can subtract in these examples.

Find the remainders:

	(1)	(2)	(3)	(4)	(5)
(*A*)	2845	6235	7094	4286	8406
	917	948	1920	905	6978
(*B*)	9142	9188	1239	3577	5242
	7076	2748	720	2960	4165
(*C*)	9561	8746	9407	7496	8233
	8968	2662	1348	4560	4358
(*D*)	7364	6778	5831	9259	6091
	3899	5996	4940	4804	3692
(*E*)	8307	6605	4527	3115	5103
	2923	2813	2531	392	260

Test VIII. Multiplication

Many problems and exercises in the fifth-grade work will have multiplication in them. Your answers will be wrong, if you do not know your multiplication combinations. You will also have to know how to add what you have to carry. If you can do all the exercises in Tests VIII, IX, X, and XI correctly, you will have no further trouble in multiplication.

Find the products:

	(1)	(2)	(3)
(*A*)	9×590	8×690	5×570
(*B*)	8×880	9×380	98×680
(*C*)	9×470	6×480	98×790
(*D*)	8×290	9×480	98×890
(*E*)	9×580	8×140	9×990
(*F*)	9×670	608×673	800×789

Test IX. Multiplication

Find the products:

	(1)	(2)	(3)	(4)	(5)
(*A*)	285	374	594	840	293
	65	76	65	86	97
(*B*)	283	344	387	760	495
	98	87	54	65	86
(*C*)	496	485	950	394	890
	54	87	7	98	65

Test X. Multiplication

Multiply:

	(1)	(2)	(3)	(4)	(5)
(*A*)	550	465	387	460	670
	79	98	87	87	76
(*B*)	877	580	570	790	560
	97	87	98	76	89
(*C*)	780	990	698	597	490
	97	86	97	98	97

Test XI. Multiplication

Find the products:

	(1)	(2)	(3)	(4)	(5)
(*A*)	1542	2145	4251	4512	980
	204	105	307	6098	402
(*B*)	980	908	890	809	763
	501	703	809	600	401
(*C*)	637	367	736	960	340
	309	502	700	93	89
(*D*)	529	1009	670	4800	8090
	900	706	209	3002	5700

In Tests XII, XIII, XIV, and XV you are to show how well you can divide when the divisor has only one figure.

Test XII. Short Division

Find the quotients:

	(1)	(2)	(3)
(*A*)	$5\overline{)2036}$	$3\overline{)4014}$	$4\overline{)1076}$
(*B*)	$1\overline{)10357}$	$4\overline{)7312}$	$5\overline{)5010}$
(*C*)	$3\overline{)3019}$	$5\overline{)2541}$	$4\overline{)8219}$
(*D*)	$2\overline{)2012}$	$1\overline{)92468}$	$3\overline{)2020}$
(*E*)	$5\overline{)1521}$	$4\overline{)3123}$	$4\overline{)4012}$
(*F*)	$4\overline{)308}$	$3\overline{)6279}$	$5\overline{)10105}$

Test XIII. Short Division

Divide each of the following numbers by 7:

	(1)	(2)	(3)	(4)	(5)	(6)
(*A*)	1099	2134	4262	1183	3263	4040
(*B*)	1420	7052	3555	5180	6944	4795

Divide each of the following numbers by 6:

(*C*)	3655	4730	5160	2022	4016	2435
(*D*)	2119	3043	1823	5265	1091	5033

Test XIV. Short Division

Divide each of the following numbers by 7:

	(1)	(2)	(3)	(4)	(5)	(6)
(*A*)	3810	2841	12321	131	2063	2982

Divide each of the following numbers by 8:

	(1)	(2)	(3)	(4)	(5)	(6)
(*B*)	8074	707	1344	1100	4055	1251
(*C*)	4863	8151	2188	1021	942	2431
(*D*)	3247	5321	1623	5020	6872	3976

Test XV. Short Division

Divide each of the following numbers by 9:

	(1)	(2)	(3)	(4)	(5)
(*A*)	5552	6910	2724	6415	4014
(*B*)	4548	8208	8010	1216	22414
(*C*)	3347	4325	63656	2032	6605
(*D*)	2123	7361	1834	5010	7487

Test XVI. Long Division

In most cases in this test the quotient that you try first will not be the right one. Watch your remainders. All of them must be less than the divisor. If your subtrahend is too large, try a smaller figure in the quotient.

Divide as indicated:

	(1)	(2)	(3)	(4)
(*A*)	$11\overline{)1001}$	$18\overline{)900}$	$39\overline{)3510}$	$27\overline{)1890}$
(*B*)	$89\overline{)8010}$	$46\overline{)3680}$	$25\overline{)1750}$	$16\overline{)832}$
(*C*)	$75\overline{)6000}$	$37\overline{)1850}$	$48\overline{)4320}$	$58\overline{)4640}$

Test XVII. Long Division

Divide in each of the following examples:

	(1)	(2)	(3)	(4)
(*A*)	3432 ÷ 49	1892 ÷ 22	7744 ÷ 88	6600 ÷ 75
(*B*)	1566 ÷ 58	1746 ÷ 18	1221 ÷ 37	3770 ÷ 65
(*C*)	4400 ÷ 16	2079 ÷ 21	3007 ÷ 31	3239 ÷ 41

Test XVIII. Long Division

The following are hard exercises with two figures in the divisor and two in the quotient.

Find the answers to these examples:

	(1)	(2)	(3)	(4)
(*A*)	$98\overline{)7478}$	$18\overline{)1602}$	$36\overline{)3024}$	$47\overline{)3102}$
(*B*)	$69\overline{)2001}$	$72\overline{)6408}$	$86\overline{)7654}$	$27\overline{)1188}$
(*C*)	$52\overline{)5044}$	$75\overline{)4425}$	$17\overline{)1003}$	$25\overline{)2400}$

Test XIX. Long Division

In the next examples you will get more than two figures in your quotients.

Find the quotients:

	(1)	(2)	(3)	(4)
(*A*)	$15\overline{)126825}$	$93\overline{)218922}$	$84\overline{)838908}$	$72\overline{)597888}$
(*B*)	$65\overline{)644800}$	$53\overline{)524859}$	$44\overline{)421872}$	$36\overline{)318096}$
(*C*)	$25\overline{)217325}$	$14\overline{)109984}$	$95\overline{)350635}$	$89\overline{)761929}$

Test XX. Long Division

These examples have more than two figures in the divisor.

Work these examples:

	(1)	(2)	(3)
(*A*)	$231\overline{)141603}$	$144\overline{)140112}$	$1728\overline{)2089152}$
(*B*)	$231\overline{)113652}$	$144\overline{)40896}$	$1728\overline{)616896}$
(*C*)	$231\overline{)735264}$	$144\overline{)1341417}$	$1728\overline{)1492992}$

Test XXI. Long Division

Here are some hard examples in division.

Find the quotients:

	(1)	(2)	(3)
(*A*)	$11833134 \div 1689$	$63887000 \div 7956$	$61515632 \div 6829$
(*B*)	$15032786 \div 1879$	$52046609 \div 5738$	$11681000 \div 1296$

Review of Problems

These problems are like the ones you solved in the fourth grade, but they are somewhat mixed. In some of them you add, in some you subtract, in some you multiply, and in some you divide, to solve the problem. Before you solve any of the problems you must be sure that you know what to do.

Problem. Mary bought 7 yards of flannel at $1.69 a yard. How many dollars and cents did she have to pay? M

The problem has an "M" after it. "M" means multiply and it tells us that we must multiply to get the answer. In the next four tests you are asked to tell what you are going to do before you solve the problems. Write the numbers from 1 to 10 on your tablet just as they are written on this page. Now read problem 1 and decide whether you are to add, subtract, multiply, or divide. If you think you should add, write "A" on your tablet just after the figure 1. If you think you should subtract, write "S" after the 1. Write "M" if you think you should multiply and "D" if you think you should divide. When you have written one of these letters after the figure 1 on your tablet, read problem 2. Decide what you must do to solve it and write the letter which tells after the figure 2. Read the other problems and put a letter after each number on your tablet. When you have written a letter after each of the numbers on your tablet, ask your teacher to correct any mistakes that you have made.

1
2
3
4
5
6
7
8
9
10

Test XXII. Problems

Solve these problems as soon as your teacher says that the letters on your tablet are correct:

1. John bought a flash-light for $1.79 and a pair of gymnasium shoes for $2.75. What was the total cost?

2. Mrs. Brown bought 25 yards of oilcloth 47 inches wide for 38 cents a yard. How much did she pay?

3. James earned $13.59 in June and $18.37 in July. How much did he earn in all?

4. Mrs. Adams bought an electric toaster for $3.75. She paid for it with a five-dollar bill. How much change should she receive?

5. Mr. Smith put 144 pairs of overalls on sale on Monday morning. Monday night he counted and found 95 of them left. How many pairs did he sell on Monday?

6. Four boys on our street cleaned Mrs. Jones's yard for her. When they were through she gave them a basket of walnuts. The boys counted the walnuts and found that there were exactly 192. How many walnuts should each boy get?

7. Tom is saving his money to buy a bicycle that costs $25.00. He has already saved $18.79. How much more must he save?

8. Ruth's teacher gave her a book to read. Ruth read 18 pages before supper and 42 pages more after supper. How many pages did she read in all?

9. Mrs. Carter paid $4.20 for a dozen napkins. How much did each napkin cost her?

10. How many cans of salmon can be bought for $3.15, if each can costs 35 cents?

Test XXIII. Problems

Write the number of each of these problems and put the proper letter after each number as you did in Test XXII. Ask your teacher to correct any of the letters that you have wrong, and then solve the problems.

1. Mary and Jane have been picking cherries. Mary has picked 17 quarts and Jane has picked 15 quarts. How many quarts have they both picked?

2. If it costs 65 cents to build 1 rod of fence, how much will 40 rods of fence cost?

3. William weighs 78 pounds and James weighs 59 pounds. How much heavier is William than James?

4. The baseball team bought a ball for $1.50, a mask for $2.25, and a bat for $1.25. How much did they spend in all?

5. If 48 cookies are divided equally among 24 children, how many cookies will each child receive?

6. George and Henry were each 10 years old last November. George's birthday is on November 18. Henry's is on November 30. How much older is George than Henry?

7. If 1 roasted chicken serves 4 people, how many chickens will be needed to serve 20 people?

8. Four brothers wish to buy a radio set. Each boy can pay $8.00. How much money can they spend for the set?

9. If 1 roasted chicken serves 4 people, how many people will 5 chickens serve?

10. Tom's father runs a dairy farm. He has 28 cows, and Tom helps to look after them. Last night 19 cows came up at feeding time. How many did not come up?

Test XXIV. Problems

Write the number of each problem, and the letter that shows what to do, and then solve the problem:

1. Mary bought 5 handkerchiefs that were on sale for $1.20. How much did each handkerchief cost her?

2. Alfred went to town to buy Christmas presents. He bought a popgun for 25 cents for his little brother, a ring for 75 cents for his little sister, a necktie for 45 cents for his father, and a bottle of perfume for 98 cents for his mother. How much did Alfred spend in all?

3. James and William went to town to buy raincoats. James bought one for $15.00. William thought that this was too much. He went to another store where a sale was going on and bought a coat just like the one James bought, but he had to pay only $11.25. How much money did William save?

4. If 1 horse eats 18 ears of corn a day, how many ears of corn will 36 horses eat?

5. If 1 horse eats 18 ears of corn in a day, how many horses can be fed with 36 ears of corn?

6. Jane went to town to buy some toys for the baby. She bought a little automobile for 60 cents, a rattle for 15 cents, a large colored ball for 98 cents, and a doll for 69 cents. How much did she spend in all?

7. Jane paid for these toys with a ten-dollar bill. How much change did she receive?

8. If gingham dresses are selling at $2.98, how much will three such dresses cost?

9. John is buying a violin for $35.00. He is to pay $5.00 a month. How many payments will he have to make?

10. Our school orchestra needs a set of drums and bells. The drums cost $25.00 and the bells $18.00. How much money is needed in all?

Test XXV. Problems

Write the number of each problem, and the letter that shows what to do, and then solve the problem:

1. The boys are saving money to buy a punching bag. The bag that they want costs $5.00. They have saved $2.83. How much more must they save?

2. If silk is selling at $1.98 a yard, how much will 4 yards of silk cost?

3. The girls in our school want to buy a volley ball. Each girl is willing to give 25 cents. The ball costs $3.75. How many girls will be needed to pay for the ball?

4. If it takes 15 minutes to pick 1 quart of berries, how many minutes will it take to pick 8 quarts? How many hours is this?

5. The round-trip fare from Westfield to Granby is $3.17. How much money will be required to pay the fares of the Westfield baseball team of 11 men on a trip to Granby and return?

6. When the Granby baseball team comes to Westfield, their railroad fare for the round trip is $34.87. Their expenses for meals are $11.00 and for lodging $13.75. What is the total expense of their trip?

7. Grace is 59 inches tall. Ruth is 65 inches tall. How much taller is Ruth than Grace?

8. If 1 quart of ice cream serves 5 people, how many quarts will be needed to serve 35 people?

9. The laundry company charges Mrs. Adams $5.00 for a week's washing when a man has to come after it and deliver it. But if someone takes the washing to the laundry and goes after it, the cost is $4.50. Mary Adams is Mrs. Adams's daughter. She has a little wagon on which she can haul the washing every week. Mrs. Adams told Mary that if she would take it back and forth each week she could have for her own money what was saved. How much will Mary earn each week if she accepts her mother's offer?

Review of Problems with Two Steps

In the problems which you have just had there was only one thing to be done in each problem. In those that follow there will be two things to do in each problem. Write down the numbers of the problems on your tablet. Then read the problems over, one by one, and

write after the number of each problem the two letters which stand for the two things that must be done to solve the problem correctly. Put first the letter that tells what to do first. Then solve the problem.

Problem. Mrs. Jones bought 3 yards of gingham at 28 cents a yard and a bracelet for $15.25. How much did she spend in all? M A

This problem has "M A" written after it, because you must multiply and then add to get the right answer. Write down the two letters for each problem before you start solving it.

1. If 4 dozen cookies are divided equally among 24 boys, how many cookies will each boy get?

2. Mary is planning to have a party. She plans to serve ice cream to 18 children, including herself. She expects a quart of ice cream to serve 6 children. Her brother, who is not invited, thinks that she will have to buy 4 quarts of cream. Is he right? If not, what is the difference between his answer and the right one?

3. For this party Mary has bought 40 cookies. If she serves 2 cookies to each of her guests and to herself, will she have enough? How many, if any, of the cookies will be left over?

4. John earned some money yesterday mowing lawns. He worked 5 hours and received 40 cents an hour for his labor. He had to pay out 50 cents for repairs on his lawn mower, and found that he had only $1.50 left when he got home. He thought that he had lost some of his money. Had he? How do you know?

5. Grace and Ruth are trying to find out which one has the higher average at school. Here are their standings:

Grace's Standings		Ruth's Standings	
Reading	83	Reading	85
Spelling	90	Spelling	83
Arithmetic	88	Arithmetic	80
History	78	History	81
Geography	80	Geography	75
Physiology	85	Physiology	88

Which girl's average is higher? How much higher is it?

6. The girls in our grade are planning to go camping for one week after school is out. For each girl who goes, they plan to take 8 pounds of food and 10 pounds of bed clothing. If 20 girls go, how many pounds will their food and bed clothing weigh?

7. If I buy 3 baseballs at $1.25 each and pay for them with a five-dollar bill, how much change should I receive?

8. How many dozen eggs will be needed for 4 cakes if each cake requires 9 eggs?

9. Mr. Smith has a store. He buys ribbon on spools. Each spool is supposed to have 10 yards of ribbon on it, but Mr. Smith suspects that some of the spools do not have that much. On Monday he sold 2 yards of ribbon from the same spool to each of 4 customers. The spool then had 1 yard left on it. Did the spool have 10 yards on it in the beginning? If not, how many yards did it have?

10. James and Tom have been playing bean bag. This is the way they play it. They draw three circles like these on the floor with chalk. Then they stand just six feet away and try to toss bean bags into the circles. Each boy throws five times. If a bag falls inside the smallest circle, it counts 10 points. If it falls between the middle circle and the smallest circle, it counts 5 points. If it falls between the middle circle and the largest circle, it counts 3 points. If it falls outside the largest circle, it doesn't count anything.

This is how the circles looked after James and Tom threw:

James

Tom

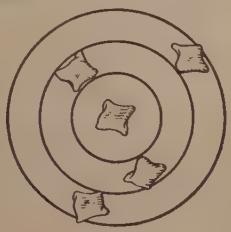
How many bags did each boy throw? Whose bag fell outside?

What was James's score? What was Tom's score? Which boy won? By how much?

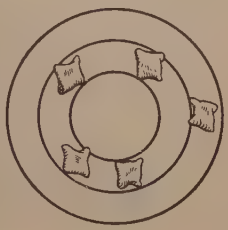
Eight boys and girls had a game of bean bag.

11. Who had the higher score, Ted or Mabel? How much higher?

Ted



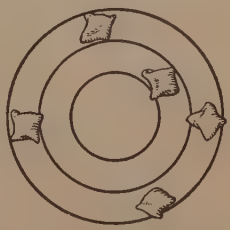
Mabel



12. Who had the higher score, Kate or Sue? How much higher?

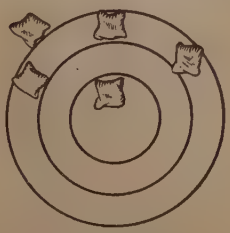
Kate

Sue



13. Who had the higher score, Joe or Fred? How much higher?

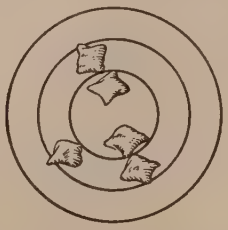
Joe



Fred

Which of the boys seems to have the steadier aim?

14. Who had the higher score, Mary or Sam? How much higher?

Mary  Sam

15. In the game, Ted and Mabel were partners, Kate and Sue were partners, Joe and Fred were partners, and Mary and Sam were partners. Which partners won? Which partners were second?

16. Which had the higher total score, the boys or the girls? How much higher?

17. Jane's father gives her $2.00 each Christmas to spend as she likes. One time when Jane went shopping with her $2.00 this is what she saw:

Embroidery, 6¢ a yard
Belts, 25¢ each
Ribbon, 13¢ a yard
Linen handkerchiefs, 42¢ each
Hose, 68¢ a pair
Paint and brush set, 45¢
Skirt hangers, 5¢ each
Combs, 28¢ each
Powder puffs, 19¢ each
Phonograph records, 50¢ each
Veils, 60¢ each
Gloves, 85¢ a pair
Bottles of perfume, 98¢ each
Nail polishers, $1.50 each
Hair nets, 7¢ each
Purses, 30¢ each
Thimbles, 35¢ each
Rings, 90¢ each

Make out four ways in which Jane can buy at least three different things with her $2.00. Tell in each case how much of the $2.00 she will have left.

18. Alfred is Jane's brother. He also receives $2.00 to spend. This is what Alfred saw when he went shopping:

Marbles, 10 ct. a dozen
Shoe trees, 7 ct. each
Violin strings, 4 ct. each
Belt buckles, 19 ct. each
Flash-light batteries, 17 ct. each
Folding rules, 15 ct. each
Candy, 40 ct. a pound
Popguns, 25 ct. each
Pliers, 28 ct. each
Hand balls, 38 ct. each
Suspenders, 45 ct. each
Hammers, 50 ct. each
Caps, 60 ct. each
Fishing rods, 75 ct. each
Hatchets, 95 ct. each
Pocket knives, $1.10 each
Nails, 3 ct. a pound
Mouth organs, 65 ct. each

Make out four ways in which Alfred can buy at least three things with his $2.00. Tell in each case how much of the $2.00 he will have left.

19. Canoes cost $60.00. John and Harry want one. They each have $12.00. They want to find some more boys who will give $12.00 apiece toward the canoe. How many more boys do they need?

20. Mary baked 36 cookies. The family had 8 of them for supper and she gave a dozen to one of the neighbors. She counted what she had left and found only 16. She thought the dog had eaten some of them. Had he?

21. Grace needs 4 new pairs of stockings. In the store near her home stockings are selling at $1.00 a pair. At a store down the street stockings just as good are on sale at 79 cents a pair. How much will Grace save on the 4 pairs if she buys them at the store down the street?

22. Twelve cans of salmon cost $4.20 when you buy one can at a time. But if you buy all 12 of them at once, you have to pay only $3.96. How much do you save on each can by buying 12 at once?

Checking Grocery Bills

Many people pay their grocery bills once a month. If they do this, the grocer sends a bill with each order made during the month. This is the way a grocer's bill looks.

1

All accounts must be settled at least once a month

MADISON, WIS., 4/4 1925

Mrs. John Lingham
119 Littleton Street.

To **M. L. COWAN,** Dr.

Dealer in

Groceries, Fruits, and Vegetables
Fresh Oysters and Fish

Telephone: Dedham 423 119 Davis Street

4/4	1	can Tuna Fish		40
"	1	" Pears		50
"	1	" Peaches		40
"	1	" Pineapple		40
"	3/8	lb. Swiss Cheese		14
"	1	" Wis. Cheese		30
"	2	large Grapefruit		25
"	2	pkg. Crackers		50
"	1	" Cereal		15
"	2	" Soap Flakes		24
"	1	lb. Prunes		25
			$3	63

Did the grocer add correctly? Is $3.63 the right amount?

During the first week in April Mrs. Miller received the following bills for groceries ordered. Add each one and see which answers are wrong. Tell what they should be.

2. *April 2*

1 loaf rye bread	$.13
1 loaf bread	.09
5 cucumbers	1.30
1 pepper	.07
1 box berries	.35
1 bottle horse radish	.15
1 carton cottage cheese	.10
2 jars preserves	.75
	$2.94

3. *April 3*

1 dozen eggs	$.32
3 lb. tomatoes	1.00
1 head lettuce	.13
	$1.45

4. *April 4*

2 grape fruit	$.20
½ peck potatoes	.13
1 lb. lard	.23
1 lb. butter	.48
rock salt	.10
soap	.25
	$1.29

5. *April 5*

1 pk. potatoes	$.32
1 lb. tuna fish	.35
2 tomatoes	.18
1 head lettuce	.13
6 Florida oranges	.38
2 pkg. cleansing powder	.20
1 loaf bread	.13
	$1.69

6. *April 6*

1 lb. butter	$.50
2 lb. prunes	.50
3 tomatoes	.38
½ pt. cream	.14
1 loaf bread	.13
1 jar preserves	.50
	$1.90

7. *April 8*

1 head lettuce	$.13
1 bunch carrots	.08
1½ lb. spinach	.05
1 loaf bread	.13
½ lb. asparagus	.18
1 bunch beets	.10
	$ .77

8. *Total of bills*

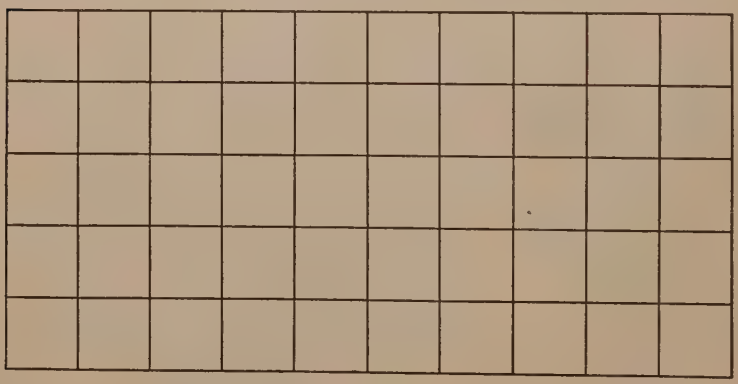
April 2	$2.94
April 3	1.45
April 4	1.29
April 5	1.69
April 6	1.90
April 8	.77
	$8.75

9. Some of the totals on Mrs. Miller's bills are wrong. Look at the right answers to examples 2 to 8 and find out how much money was lost because of the mistakes. Who lost the money?

Review of Fractions

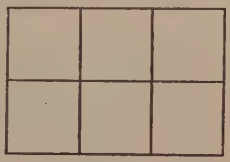
Some Things for You to Do

1. Get a pasteboard shoe box and cut out the ends of it. Then cut the sides loose from the bottom. Get your ruler and pencil and draw lines on the bottom of the box as



here shown. Draw the lines so that they will be exactly one inch apart. Then take your scissors and cut along each line that you have drawn. You will get little pieces of pasteboard. Each of them will have four edges, and each edge will be about one inch long. A piece of pasteboard like this may be called a pasteboard square. You will need about one hundred of these squares. Use the sides, ends, and lid of your box if you need them.

2. Lay three squares side by side. Then lay three more just above them, as shown at the side of the page. The three on the bottom are called the bottom row. The three on the top are called the top row. The two on the right are called the right-hand column. The two on the left are called the left-hand column. The two in the middle are the middle column.



Each column has two squares, and each row has three squares. You can separate the six squares into two equal parts by moving the rows apart. You can also divide or separate the six squares into three equal parts by moving the columns apart. Each of the two equal parts is called one half, or $\frac{1}{2}$, as it is more frequently written. Each row is $\frac{1}{2}$ of all six squares. One half of six equals three, or, as it is sometimes written, $\frac{1}{2}$ of $6 = 3$. When you separate the columns, you get three equal parts of six. Each of these parts contains two squares. When there are three equal parts, each part is called one third. One third of six equals two, or, as it is sometimes written, $\frac{1}{3}$ of $6 = 2$.

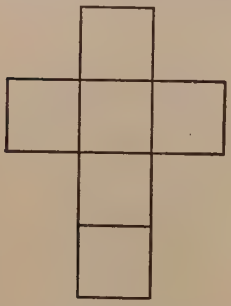
3. Place the six squares like this:

Can you show your teacher $\frac{1}{2}$ of 6 and $\frac{1}{3}$ of 6? Try it and see if you are right.

4. Try it when the squares are like this:

5. Try it when the squares are like this:

6. When they are like this:



7. When they are like this:

8. Take eight squares.

How can you place them so as to have the same number of squares in each column? Can you make two equal rows? Can you make three equal rows? Can you make four? When there are two equal rows, how many squares are in each column? How many are in each column when there are four equal rows? When eight squares are placed in four rows, each column has two squares in it. One fourth of 8 equals 2, or, as it is sometimes written, $\frac{1}{4}$ of $8 = 2$.

9. Fill in the following blanks without pencil or pen:

a. When there are two equal rows or parts, each part is called one half ($\frac{1}{2}$).

b. When there are three equal rows or parts, each part is called one third ($\frac{1}{3}$).

c. When there are four equal rows or parts, each part is called one fourth ($\frac{1}{4}$).

d. When there are five equal rows or parts, each part is called ____.

e. When there are six equal rows or parts, each part is called ____.

f. When there are seven equal rows or parts, each part is called ____.

g. When there are eight equal rows or parts, each part is called ____.

h. When there are nine equal rows or parts, each part is called ____.

10. Get the answers to the following examples:

a. Find $\frac{1}{2}$ of each of these numbers:
18, 10, 4, 16, 2, 14, 8, 12, 6

b. Find $\frac{1}{3}$ of each of these:
15, 27, 3, 24, 9, 21, 6, 18, 12

c. Find $\frac{1}{4}$ of each of these:
36, 8, 28, 4, 32, 12, 24, 20, 16

d. Find $\frac{1}{5}$ of each of these:
45, 10, 40, 35, 5, 30, 15, 25, 20

e. Find $\frac{1}{6}$ of each of these:
12, 48, 36, 42, 18, 54, 6, 24, 30

f. Find $\frac{1}{7}$ of each of these:
28, 14, 35, 21, 42, 7, 49, 63, 56

g. Find $\frac{1}{8}$ of each of these:
40, 48, 8, 56, 16, 64, 24, 72, 32

h. Find $\frac{1}{9}$ of each of these:
72, 36, 63, 27, 54, 18, 45, 9, 81

11. Read these once and fill in the blanks as you read. Do not use your pencil or pen. If you cannot fill in one of the blanks, go on to the next one.

a. There are three 9's in 27.	Nine is $\frac{1}{3}$ of 27.
b. There are nine 3's in 27.	Three is $\frac{1}{9}$ of 27.
c. There are seven 4's in 28.	Four is $\frac{1}{7}$ of 28.
d. There are four 7's in 28.	Seven is $\frac{1}{4}$ of 28.
e. There are —— 6's in 48.	Six is —— of 48.
f. There are —— 8's in 32.	Eight is —— of 32.
g. There are —— 9's in 54.	Nine is —— of 54.
h. There are —— 6's in 30.	Six is —— of 30.
i. There are —— 4's in 36.	Four is —— of 36.
j. There are —— 6's in 54.	Six is —— of 54.
k. There are —— 9's in 45.	Nine is —— of 45.
l. There are —— 6's in 42.	Six is —— of 42.
m. There are —— 8's in 56.	Eight is —— of 56.
n. There are —— 4's in 32.	Four is —— of 32.
o. There are —— 7's in 56.	Seven is —— of 56.
p. There are —— 8's in 48.	Eight is —— of 48.

12. *a.* There are —— 7's in 49.	Seven is —— of 49.
b. There are —— 9's in 81.	Nine is —— of 81.
c. There are —— 5's in 45.	Five is —— of 45.
d. There are —— 8's in 72.	Eight is —— of 72.
e. There are —— 7's in 35.	Seven is —— of 35.
f. There are —— 9's in 72.	Nine is —— of 72.
g. There are —— 8's in 40.	Eight is —— of 40.
h. There are —— 7's in 63.	Seven is —— of 63.
i. There are —— 5's in 35.	Five is —— of 35.
j. There are —— 7's in 42.	Seven is —— of 42.

k. There are —— 5's in 30. Five is —— of 30.
l. There are —— 9's in 63. Nine is —— of 63.
m. There are —— 8's in 64. Eight is —— of 64.
n. There are —— 6's in 36. Six is —— of 36.
o. There are —— 9's in 36. Nine is —— of 36.
p. There are —— 5's in 40. Five is —— of 40.

13. Write the letters from *a* to *z* on your tablet. Look at this:

$\frac{1}{2}$ of 18 balls	9 balls	S
$\frac{1}{3}$ of 27 apples	8 apples	D

In the first case $\frac{1}{2}$ of 18 balls is the same as 9 balls. The letter "S" means same. In the second case $\frac{1}{3}$ of 27 apples is not the same as 8 apples. It is different from 8 apples. The letter "D" means different. After the letter *a* on your tablet you are to write the capital letter that makes example *a* true. After the letter *b* you are to put the right capital letter for example *b*. Do the same for every other example. Do not write in your book.

a. $\frac{1}{9}$ of 27 acres	3 acres	*n*. $\frac{1}{7}$ of 42 feet	7 feet
b. $\frac{1}{6}$ of 30 bushels	6 bushels	*o*. $\frac{1}{4}$ of 32 cents	9 cents
c. $\frac{1}{8}$ of 32 cents	4 cents	*p*. $\frac{1}{8}$ of 40 days	5 days
d. $\frac{1}{7}$ of 35 dollars	6 dollars	*q*. $\frac{1}{5}$ of 45 feet	9 feet
e. $\frac{1}{9}$ of 63 months	7 months	*r*. $\frac{1}{6}$ of 48 hours	8 hours
f. $\frac{1}{9}$ of 81 pints	9 pints	*s*. $\frac{1}{9}$ of 72 pecks	9 pecks
g. $\frac{1}{8}$ of 64 ounces	7 ounces	*t*. $\frac{1}{8}$ of 72 pecks	8 pecks
h. $\frac{1}{5}$ of 30 bushels	5 bushels	*u*. $\frac{1}{4}$ of 36 cu. in.	8 cu. in.
i. $\frac{1}{9}$ of 45 gallons	5 gallons	*v*. $\frac{1}{5}$ of 40 dimes	8 dimes
j. $\frac{1}{7}$ of 56 minutes	7 minutes	*w*. $\frac{1}{8}$ of 48 inches	7 inches
k. $\frac{1}{6}$ of 36 cu. ft.	6 cu. ft.	*x*. $\frac{1}{6}$ of 54 miles	8 miles
l. $\frac{1}{8}$ of 56 minutes	8 minutes	*y*. $\frac{1}{9}$ of 36 cu. yd.	4 cu. yd.
m. $\frac{1}{5}$ of 35 dollars	7 dollars	*z*. $\frac{1}{6}$ of 42 feet	8 feet

CHAPTER II

FRACTIONS AND DENOMINATE NUMBERS

When one number is written above another with a line drawn between them, the whole thing is called a **fraction.** $\frac{1}{4}$, $\frac{3}{7}$, $\frac{2}{2}\frac{1}{2}\frac{5}{3}$, $\frac{8}{5}$, are all fractions. A fraction of anything is one or more parts of it.

Mary Adams has two little brothers and one little sister. Sometimes the children get hungry. Yesterday Mary bought a small pie to share with them. She cut the pie into four equal parts, or pieces, as here shown. In this way she divided the pie equally among four children. Each child received $\frac{1}{4}$ of the pie and there were four fourths $(\frac{4}{4})$ in all. The boys ate $\frac{2}{4}$ of the pie and the girls ate $\frac{2}{4}$ of it. Mary ate $\frac{1}{4}$ of it. The other children together ate $\frac{3}{4}$ of it. Was any of the pie left after that?

1. Draw a picture showing how a cake would look after it had been cut into equal pieces for 6 children.

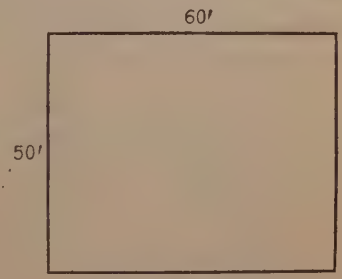
2. Draw a picture of one of the pieces.

3. Write the fraction which tells what part of the cake is in each piece.

4. Write the fraction which tells what part of the cake is in 3 pieces; in 5 pieces; in 7 pieces.

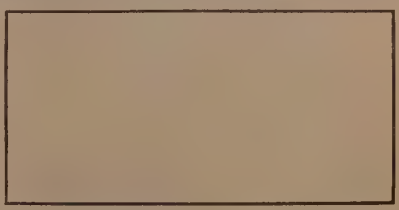
5. In this picture a watermelon has been cut into 8 equal pieces. Write the fraction that is the right answer to each of these questions: What part of the melon is 1 piece? What part of it are 2 pieces? 4 pieces? 6 pieces? 8 pieces?

6. Our school garden is shaped like this figure. Thirty of the children in the school want to plant gardens. Copy this picture on your tablet and draw in the lines which show how the garden will look after it has been divided into 30 equal parts which are each 10 feet wide and 10 feet long. What part of the whole garden will each child have? What part of it will 15 children have? 23 children? 9 children?



The Sign ′ Means Feet

7. Tom, Jerry, Dick, and George live in the country and belong to a corn club. Their father let them plant their corn in a long narrow field that looked like this figure. In the country they plant corn in long rows when they can; so the boys divided their field into long, narrow strips, each containing an equal amount. Copy this picture on your tablet and draw the lines which



tell how the boys divided their field. What part of the whole field did each boy get? What part of the field did 2 boys get? 3 boys? Write your answers as fractions.

8. Mary, Kate, and Louise planned to raise tomatoes and sell them. Their father found an oddly shaped lot near home that they could use. It looked like this figure. Copy this picture on your tablet and show two ways in which the three girls can divide the lot equally. In each case what part of the lot will each girl have? What part will two girls have? Write your answers as fractions.

9. Every fraction can be written in two ways. Read over the following list and write on your tablet what has been left out:

$\frac{1}{2}$ one half	— one fourth	— four fifths
$\frac{1}{3}$ one third	$\frac{3}{4}$ _____	$\frac{18}{21}$ _____
$\frac{2}{3}$ two thirds	$\frac{1}{5}$ _____	$\frac{7}{12}$ _____
— nineteen forty-seconds		$\frac{9}{11}$ _____

Measuring Lengths and Distances

Use this list of facts for reference. Memorize them as quickly as you can, if you do not already know them.

1 mile (mi.) = 5280 feet (ft.) 1 foot (ft.) = 12 inches (in.)
1 mile (mi.) = 1760 yards (yd.)
1 yard (yd.) = 3 feet (ft.) 1 yard (yd.) = 36 inches (in.)
1 mile (mi.) = 320 rods (rd.)

1. *a*. How many yards are there in $\frac{1}{1760}$ of a mile?
   b. How many feet are there in $\frac{1}{1760}$ of a mile?
   c. How many rods are there in $\frac{1}{1760}$ of a mile?
   d. How many inches are there in $\frac{1}{18}$ of a yard?

2. *a*. How many rods are there in $\frac{5}{8}$ of a mile?
   b. How many yards are there in $\frac{3}{8}$ of a mile?
   c. How many feet are there in $\frac{7}{8}$ of a mile?
   d. How many inches are there in $\frac{4}{9}$ of a yard?

3. *a*. How many inches are there in $\frac{5}{12}$ of a yard?
   b. How many rods are there in $\frac{3}{4}$ of a mile?
   c. How many yards are there in $\frac{1}{4}$ of a mile?
   d. How many feet are there in $\frac{2}{3}$ of a mile?

4. Change each of the following to inches:

a. 1 foot 8 inches	*e*. 3 feet 9 inches
b. 1 foot 3 inches	*f*. 1 foot 10 inches
c. 2 feet 4 inches	*g*. 1 foot 2 inches
d. 2 feet	*h*. 3 feet 3 inches

5. Tell how many feet and inches there are in each of these lengths:

a. 54 inches	*f*. 30 inches
b. 18 inches	*g*. 38 inches
c. 27 inches	*h*. 16 inches
d. 20 inches	*i*. 51 inches
e. 22 inches	*j*. 15 inches

The foot ruler, the yardstick and a six-foot folding rule are used for the most part to measure short lengths and distances. How well can you measure?

6. Measure the length and width of your room at school. Can you find out how high the room is? How far is it from the chalk tray to the floor in your classroom? How high are the bottoms of the windows from the floor?

7. Find a baseball diamond. See how far it is from home plate to first base; from first base to second; from second base to third; from third base home. How far is it from home to the pitcher's box? How far from the pitcher's box to first base? to second base?

8. Who in your school can knock a ball the farthest when he stands at the home plate and hits a ball thrown from the pitcher's box? Have a contest and find out how far the ball goes each time before it hits the ground. Let each boy have three trials. Record the best distance that is made by each one.

How will you measure the distance that the ball goes? Here is a good way to do it. Get a rope or piece of twine a little more than ten yards long. Tie a sharpened stick at each end of the rope, like this:

Tie the sticks so that they will be exactly 10 yards apart. How many feet will there be between the sticks when the rope is stretched tight? Tie small pieces of twine around the rope so that they will be exactly one yard apart when the rope is stretched. How many pieces of twine will you need? Use this rope to measure the distance that each

boy can knock the ball. Guess at the number of feet when you need a part of a yard.

9. Find a vacant lot or field and mark off a baseball diamond, using the results which you obtained in example 7. Measure from the home plate to about where the right fielder should stand. Perhaps the results you get in example 8 will help you. Find where the left fielder should stand. Find where the center fielder should stand.

10. The fifth-grade boys of the Jefferson School have just had their batting contest. Each time they measured the distance to where the ball stopped with the ten-yard rope or line. The following list shows how far each boy knocked the ball:

Henry Smith	2 ten-yard lengths, 8 yards, 2 feet
James Oliver	3 ten-yard lengths, 4 yards, 1 foot
Robert Allen	4 ten-yard lengths, 2 feet
John Davis	3 ten-yard lengths, 6 yards, no feet
George Anderson	3 ten-yard lengths, 5 yards, 1 foot
James Conrad	3 ten-yard lengths, 3 yards, 2 feet
Arthur Collins	2 ten-yard lengths, 9 yards, 1 foot
William Robbins	4 ten-yard lengths, 1 yard, 2 feet
John Rader	2 ten-yard lengths, 7 yards, 1 foot
Tom Jones	4 ten-yard lengths, 2 yards, no feet
Oscar Rand	3 ten-yard lengths, 8 yards, 1 foot
Dan Wilson	3 ten-yard lengths, 6 yards, 2 feet
Allen McGregor	3 ten-yard lengths, 4 yards, no feet
Martin Taylor	4 ten-yard lengths, 1 foot
Patrick Murphy	3 ten-yard lengths, 5 yards, 2 feet

How many feet did each boy knock the ball? What was the average of the boys of the Jefferson School?

11. How do the records made by the boys in your room compare with those made by the fifth-grade boys of the

Jefferson School? Which school made the higher average? How much higher? Did anyone in your school knock the ball farther than Tom Jones in the Jefferson School did? Was there anyone who failed to knock the ball as far as John Rader did?

12. Girls like to play baseball, too. They generally use a smaller diamond than the boys do and a softer ball that does not go so far when they hit it. The following figures show the size of the diamond which some girls use. It is 21 feet from the home plate to the pitcher's box. It is 21 feet from the pitcher's box to first base and 21 feet from the pitcher's box to third base. Second base is 30 feet from first base and 30 feet from third base. First base and third base are each 30 feet from the home plate. Lay off on the school yard or some other suitable place a diamond for the girls.

13. How far can the girls in your room knock their ball? Make a ten-yard measure just like the one for the boys (see example 8). Have a contest just like the one that the boys had. Each girl is to get credit for the best distance made in three trials. Find about where each fielder should stand.

14. Look at problem 15 on page 39. Read the first two sentences and examine the records. How do the records made by the girls in your room compare with those made by the fifth-grade girls of the Jefferson School? Did anyone in your school knock the ball farther than Grace Roberts in the Jefferson School did? Was there anyone who failed to knock the ball as far as Sarah Perkins did?

15. The girls in the fifth grade of the Jefferson School have just had a contest of this sort. These are the records that they made:

Jane McCormick	1 ten-yard length, 4 yards, 1 foot
Mary Morton	1 ten-yard length, 8 yards, 2 feet
Grace Roberts	2 ten-yard lengths, 1 yard, no feet
Frances Williams	1 ten-yard length, 3 yards, 2 feet
Martha Adams	2 ten-yard lengths, 2 feet
Ruth Johnson	1 ten-yard length, 7 yards, 1 foot
Sarah Perkins	9 yards, 2 feet
Rebecca Goldstein	1 ten-yard length, 1 foot
Anna Thompson	1 ten-yard length, 5 yards, 1 foot
Ella Murphy	1 ten-yard length, 2 yards, 2 feet
Kate Brown	1 ten-yard length, 2 feet
Olive Nardin	1 ten-yard length, 6 yards, 1 foot
Rose Smith	1 ten-yard length, 1 yard, 2 feet
Ethel Wilson	1 ten-yard length, 8 yards, no feet
Alice Boyd	1 ten-yard length, 2 feet

How many feet is that for each girl? What is the average for the girls in the Jefferson School?

16. Use a ten-yard line to measure the length of a block in your village or city. How many blocks of this sort does it take to make a mile? (A mile is 5280 feet.) Or, if you live in the country, measure the length of an orchard, using a ten-yard rope. One mile is how many times as long as your orchard?

Finding Contents

Do you know how to measure water, lemonade, cider, and other liquids? How do people measure berries, apples, and potatoes? The facts which follow will help you to answer these questions. Copy them in your tablet for reference and memorize them as soon as you can.

Facts used mostly in measuring liquids:

1 gallon (gal.) = 4 quarts (qt.)
1 gallon (gal.) = 8 pints (pt.)

Facts used mostly in measuring berries, apples, and the like:

1 bushel (bu.) = 32 quarts (qt.)
1 bushel (bu.) = 4 pecks (pk.)
1 peck (pk.) = 8 quarts (qt.)

Facts used in measuring both liquids and things not liquids:

1 quart (qt.) = 2 pints (pt.)
1 pint = 2 measuring cupfuls
1 measuring cupful = 48 teaspoonfuls
1 measuring cupful = 16 tablespoonfuls

Tell how many quarts there are in each of the quantities in (A), examples 1 to 8.

(*A*) 1. $\frac{1}{2}$ bushel.
2. $\frac{1}{8}$ bushel.
3. 5 bushels.
4. 2 bushels.
5. 4 bushels.
6. 6 bushels.
7. $\frac{1}{4}$ bushel.
8. 3 bushels.

(*B*) 1. How many pecks are there in 9 bushels?
2. How many teaspoonfuls in a tablespoonful?

3. How many half-pints in 3 quarts?

4. How many pints in $\frac{1}{2}$ gallon?

5. How many quarts in $\frac{1}{8}$ peck?

A School Picnic

1. There are 240 people in the Albion School, counting both pupils and teachers. They had a picnic in the woods last Saturday. They went early in the morning and returned late in the evening. They took 4 three-gallon pails, in which the boys carried water from a well. During the day 130 persons drank 2 glasses (cupfuls) of water and 110 persons drank only 1 glass. How many gallons of water did the boys have to carry for drinking purposes?

2. The boys brought 4 pails full of water from the well on each trip. How many gallons was that?

3. How many trips did they have to make for the drinking water?

4. The chocolate committee planned to make 28 gallons of chocolate for dinner. They planned to use $\frac{1}{2}$ water and $\frac{1}{2}$ milk. When they went to get the milk, the storekeeper had only pint bottles. How many pint bottles of milk were needed?

5. The boys carried the water for the chocolate in two trips. They brought 12 gallons each time. How much water was left over after the chocolate was made?

6. At dinner everybody drank 1 cup of chocolate, and 210 people wanted a second cup. Was there enough to give a second cup to everyone that wanted it?

7. In the afternoon lemonade was to be served. The children made lemonade enough to give each person 2 glassfuls, if anyone wanted as much as that. How many gallons of lemonade did they make?

8. The children had 10 gallons of water left after making the chocolate. How many trips did the boys have to make to the well to get enough water for the lemonade mentioned in problem 7?

9. The boys who carried the water made 6 trips to the well during the day. They brought 4 pails full on each trip. They were a little careless once in a while, spilling about 1 quart of water from each pailful that they carried. How many quarts did they spill all together? How many pailfuls was this?

10. How many gallons of water did the boys carry on their 6 trips, including what they spilled?

11. They planned to serve ice cream for supper. They bought it at a store which was close by. If 1 quart of ice cream serves 6 people, how many gallons of cream did they need?

12. They planned to have apples for dinner. If there are 20 apples in a peck, were 3 bushels of apples enough to give each person 1 apple? Prove your answer.

13. For supper they planned to roast potatoes in the ashes. The father of one of the boys offered to give them some small potatoes which he could not sell. Counting 30 of these potatoes to the peck, how many bushels of potatoes did they take if each person ate 2?

14. If one lemon makes 2 glasses of lemonade, how many dozen lemons did they need to give 2 glasses to each of the 240 people?

15. The children brought 25 pounds of sugar with them. They figured that there are 60 teaspoonfuls of sugar to the pound and that they had sugar enough for 1 teaspoonful to each of the 448 cups of chocolate and 2 teaspoonfuls for each of the 480 glasses of lemonade. Were they right? Prove your answer.

16. How many pints are there in 448 cups of chocolate?

17. How many quarts are there in 480 glasses of lemonade?

18. Many of the children spent much of their time gathering nuts which they put into sacks. When they started home they had 5 sacks full. If there were 2 bushels in each sack, how many pecks did they have all together?

Find the sums of the following columns:

1	2	3	4	5
6200			1438	
8960	6241	4650	1230	
5479	3260	1334	2011	
2587	7444	2223	6632	4742
4335	1583	4673	1521	8608
5476	7114	3237	2171	4262
4514	2423	2646	6246	6317
2356	2818	9237	1117	7678
3112	8569	8879	2999	8778

How to Measure Areas

You have learned about inches, feet, yards, rods, and miles. Each of these tells how long, how wide, how high, or how deep things are, or how far it is from one place to another. You have also learned about teaspoonfuls, tablespoonfuls, measuring cupfuls, glassfuls, pints, quarts, gallons, and bushels. Each of these helps to tell you how much can be put into such things as pails, sacks, baskets, crates, and the like. Suppose you wanted to know how much land is in your school yard, your garden, or your father's field. You can do this if you learn the facts that are given on the following pages.

Give the answers without using pencil and paper:

	(1)	(2)	(3)
(*A*)	$13 + 3 = ?$	$81 + 6 = ?$	$64 + 7 = ?$
(*B*)	$16 + 2 = ?$	$40 + 6 = ?$	$72 + 2 = ?$
(*C*)	$26 + 6 = ?$	$48 + 7 = ?$	$54 + 4 = ?$
(*D*)	$28 + 5 = ?$	$81 + 7 = ?$	$45 + 4 = ?$
(*E*)	$31 + 7 = ?$	$40 + 7 = ?$	$54 + 5 = ?$
(*F*)	$16 + 3 = ?$	$63 + 5 = ?$	$72 + 6 = ?$
(*G*)	$17 + 8 = ?$	$15 + 9 = ?$	$23 + 9 = ?$

1. If Hiawatha's grandmother makes 3 baskets in one day, how many baskets can she make in 34 days?

2. How much more are 4490 gallons of oil than 1611 gallons of oil?

3. How much is $\frac{1}{2}$ of 14 bushels?

4. How many miles are 1864 miles and 3689 miles?

The amount of land or surface in yards, gardens, fields, and the like is called their **area.** Some fields or yards look like this:

Such fields or yards are **squares.**

Sometimes fields or yards look like this:

They are called **rectangles.**

The sides of squares or rectangles that are straight across from each other are **opposite** sides.

Give the answers without using pencil and paper:

(1)	(2)	(3)
(*A*) $0 + 3 = ?$	$81 + 8 = ?$	$45 + 5 = ?$
(*B*) $23 + 4 = ?$	$42 + 4 = ?$	$54 + 6 = ?$
(*C*) $31 + 5 = ?$	$49 + 3 = ?$	$72 + 7 = ?$
(*D*) $25 + 4 = ?$	$63 + 7 = ?$	$45 + 6 = ?$
(*E*) $31 + 6 = ?$	$42 + 5 = ?$	$54 + 8 = ?$
(*F*) $27 + 5 = ?$	$49 + 4 = ?$	$45 + 8 = ?$
(*G*) $31 + 3 = ?$	$63 + 8 = ?$	$72 + 8 = ?$
(*H*) $56 + 4 = ?$	$54 + 8 = ?$	$48 + 5 = ?$
(*I*) $36 + 8 = ?$	$27 + 7 = ?$	$64 + 6 = ?$

Some Things to Do

Take your pasteboard squares. All their sides are equal. That is why they are called squares. Each side of the pasteboard square is one inch long and the area, or amount of surface, in each square is one square inch.

1. Place 144 of these squares on your desk so that there will be 12 rows and 12 columns. You have made a large square which should measure 1 foot on each side. The area, or amount of surface, in the large square is 1 square foot. With your foot ruler draw a picture on the blackboard showing 1 square foot.

2. With a yardstick mark off out on the playground the area of 1 square yard. How many square feet does it contain?

3. Mark off with your yardstick a square with sides $5\frac{1}{2}$ yards long. How many feet long is each side? An area of this size is called a square rod. Such an area may have any shape. It does not have to be a square.

Find the remainders:

1	2	3	4	5
865	2510	990	901	3610
688	1144	787	556	1112

6. If I can earn $3.45 per week, how much money can I earn in 6 weeks?

7. Mr. Bates sells corn. He has sold 579 bushels and has 485 bushels left on hand. How many bushels of corn did he have at first?

4. You should be able to build each of these rectangles with your 144 squares:

A rectangle with 16 squares in each row.
A rectangle with 18 squares in each row.
A rectangle with 24 squares in each row.
A rectangle with 36 squares in each row.

See if you can do each one of these. Each of these rectangles contains 1 square foot. A square foot of area may be in any shape.

Copy these facts in your tablet for reference. Memorize them as soon as you can.

1 square mile (sq. mi.) = 640 acres (A.)
1 square foot (sq. ft.) = 144 square inches (sq. in.)
1 square yard (sq. yd.) = 9 square feet (sq. ft.)
1 acre (A.) = 4840 square yards (sq. yd.)
1 acre (A.) = 160 square rods (sq. rd.)

Give the answers without using pencil and paper:

(1)	(2)	(3)
(*A*) $40 + 4 = ?$	$64 + 2 = ?$	$45 + 7 = ?$
(*B*) $48 + 2 = ?$	$42 + 6 = ?$	$19 + 6 = ?$
(*C*) $56 + 3 = ?$	$49 + 6 = ?$	$27 + 8 = ?$
(*D*) $81 + 2 = ?$	$64 + 5 = ?$	$17 + 9 = ?$
(*E*) $40 + 5 = ?$	$54 + 2 = ?$	$29 + 5 = ?$
(*F*) $48 + 3 = ?$	$64 + 6 = ?$	$18 + 7 = ?$
(*G*) $56 + 7 = ?$	$45 + 2 = ?$	$16 + 9 = ?$

1. Find a large vacant place in a field or park. With your ten-yard rope mark off a distance equal to seven lengths of the rope. How many yards is this? How many feet? Now mark off a square each of whose sides is equal to the 70 yards which you have just measured. This large square is about as large as an **acre.** The area of large fields is measured in acres.

2. Get someone to tell you of some place which is one mile from the schoolhouse. Imagine a square with sides equal to one mile. The area of such a square is **one square mile.**

3. *a.* How many acres are there in $\frac{1}{2}$ square mile?
   b. How many acres in $\frac{1}{4}$ square mile?
   c. How many acres in $\frac{1}{8}$ square mile?
   d. How many square yards in $\frac{1}{2}$ acre?

4. *a.* How many square yards in $\frac{1}{4}$ acre?
   b. How many square yards in $\frac{1}{8}$ acre?
   c. How many square inches in $\frac{1}{2}$ square foot?
   d. How many square inches in $\frac{1}{3}$ square foot?

Add the following columns:

1	2	3	4	5
		2410		6340
	2180	5571	2130	8557
3540	6895	9769	4662	1467
9598	8547	5656	9849	6329
6979	4938	4354	3497	2158
9867	5349	4368	5969	1381
2378	6344	3217	8237	9701
6127	5426	4541	3414	4923

5. *a*. How many square inches in $\frac{1}{4}$ square foot?
b. How many square inches in $\frac{1}{6}$ square foot?
c. How many square inches in $\frac{1}{8}$ square foot?
d. How many square inches in $\frac{1}{9}$ square foot?

6. *a*. How many square rods in $\frac{1}{2}$ acre?
b. How many square rods in $\frac{1}{4}$ acre?
c. How many square rods in $\frac{1}{8}$ acre?
d. How many square rods in $\frac{1}{10}$ acre?

7. Tell how many square feet and square inches there are in each of these amounts:

a. 288 square inches
b. 216 square inches
c. 448 square inches
d. 738 square inches
e. 192 square inches
f. 396 square inches
g. 528 square inches
h. 168 square inches

How to Find Areas

1. Place 32 pasteboard squares on your desk so that there will be 4 rows and 8 columns. You have made a rectangle. With your foot ruler, find about how long

---

1. I saved \$30.00 in 5 weeks. How much was that per week?

2. I had \$9.87. I now have \$7.54. How much money have I spent?

3. What is the cost of 5 pounds of candy at 75 cents per pound?

4. Mrs. Jones bought a box of apples that cost \$2.25. She paid for the apples with a check for \$5.73. How much change should she receive?

5. How many dollars are \$222 and \$456?

each row is. Are the opposite sides, or edges, equal? Since you are using inch squares, the rectangle should be 8 inches long and 4 inches wide. If you have put the squares together carefully, the area of the rectangle will be 32 square inches.

2. Place 48 pasteboard squares so that there are 6 rows and 8 columns. How long is each row? How long is each column? The rows will be about 6 inches long and the columns 8 inches. What is the area of the rectangle? Count the squares if you do not know.

3. Place 9 squares in one row. The row should be about 9 inches long and about 1 inch high. It makes a long, narrow rectangle. What is the area of the rectangle? Count the squares if you do not know.

4. Place 7 squares in a column. The column will be about 7 inches high and 1 inch wide. What is the area of this rectangle? Count the squares if you do not know.

---

1. John Markham bought 9 baseballs for $4.95. What was the exact cost of each ball?

2. Mrs. Carter wants to buy a bushel of potatoes. Potatoes are selling at $1.68 per bushel and Mrs. Carter has only $1.33. How much more money does she need?

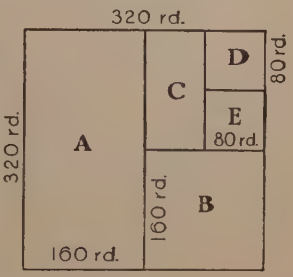
3. Helen James bought the following articles:

1 tablet	$0.12
1 book	.12
1 pencil	.05
1 umbrella	1.10
1 alarm clock	3.30

Find the total amount of her bill.

5. You can always find areas by using small squares, but there is a shorter method of doing it. Can you tell what the short method is?

You find the area of a rectangle by multiplying its length by its width. Length and width are the **dimensions.** Other names for dimensions are breadth, height, and depth. Each rectangle has two dimensions. In order to find the area of a rectangle you multiply its dimensions. A square has two dimensions also, but they are equal. So to find the area of a square you multiply the length of one side by itself. When a number is multiplied by itself we say that it has been squared.



The drawing at the right represents a square mile of land. It is 320 rods on each side, or 320 rods square. In some parts of the country a square mile of land is called a section. This square mile is divided into five farms.

6. Find the area of farm A.

7. Find the area of farm B.

8. Find the area of farm C.

9. Farms D and E are equal in size. How many square rods does each of them contain?

The drawing on the next page is the floor plan of a house.

10. How many square feet are there in room A?

11. How many square feet are there in room D?

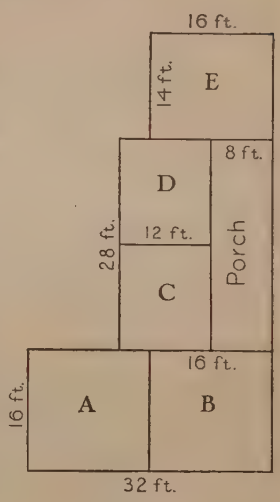
12. How many square feet are there in room E?

13. How many square feet are there in the porch?

14. Measure the top of your desk. How many square inches are there on the top of it?

15. Find the area of a sheet of paper from your tablet. Do not count parts of inches.

16. In example 1 (page 48) you learned that a square whose sides are equal to 70 yards is about as large as an acre. What is the exact area of this square? How much larger than an acre is it?



Measuring Volumes

Suppose you were asked to tell how much air is in your schoolroom. The amount of space or material that rooms, cellars, bins, and the like contain is often called their **volume.** When you measure volumes you must know the

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Subtract in the following examples:

1. $3154 - 1255 = ?$ **3.** $102 - 23 = ?$

2. $223 - 200 = ?$ **4.** $65 - 11 = ?$

5. If 1 crate of strawberries contains 32 pint boxes, how many pints are there in 24 crates of strawberries?

6. At 8 cents each how many tops can be bought for $7.84?

following facts. Copy them in your tablet or notebook for reference. Memorize them as soon as you can.

1 cubic yard (cu. yd.) = 27 cubic feet (cu. ft.)
1 cubic foot (cu. ft.) = 1728 cubic inches (cu. in.)

Some Things to Do

1. On the ground in the school yard mark off an area which is 1 foot square. Drive a stake at each corner so that the top of each stake is just 1 foot above the ground. Tie strings to the tops of the four stakes so as to make a square of string just like the square on the ground. The amount of space inside the stakes and beneath the string is called a cubic foot.

2. Make a cubic yard in the same manner.

Find the products in each of the following examples:

1	2	3	4	5
97321	286	976541	7985	78210
10	542	257	60	8752

6. There are 425 children in the Franklin School. Thirty-seven of them bring their lunches every day. The rest of the children go home for lunch. How many children go home for lunch at noon?

7. How many 25-cent articles can you buy for $1.75?

8. If a train averages 35 miles per hour, how far will it go in 65 hours?

9. Divide 7305 by 8.

To find the volume you multiply the dimensions

When used with dimensions, the sign × means by. Thus 36 in. × 16 in. × 4 in. means 36 in. by 16 in. by 4 in.

Which of these boxes contains just 1 cubic foot? Which contains less than 1 cubic foot? Which contains more than 1 cubic foot? Prove your answers.

3. Box A is 36 in. × 16 in. × 4 in.

4. Box B is 32 in. × 18 in. × 2 in.

5. Box C is 18 in. × 12 in. × 8 in.

6. Box D is 36 in. × 24 in. × 2 in.

7. Box E is 24 in. × 8 in. × 8 in.

8. Box F is 27 in. × 8 in. × 9 in.

9. How many cubic inches are there in 27 cubic feet?

10. How many cubic inches are there in $\frac{1}{3}$ cubic foot?

11. How many cubic feet are there in 31,104 cubic inches?

12. How many cubic inches are there in $\frac{5}{6}$ cubic foot?

---

1. $346 \times 7610 = ?$

2. $6595 \div 7 = ?$

3. Two hundred and twenty-eight trees are to be planted 9 in a row. How many rows will there be? How many trees will be left over?

4. How many weeks are there in 28 days?

5. $345 \times 985 = ?$

6. How many quarts are there in 962 pecks of navy beans?

Measuring Weights

In order to learn about weights we must know the meaning of ounces, pounds, and tons. Copy the following facts in your tablet or notebook for reference. Memorize them as soon as you can.

1 ton (T.) = 2000 pounds (lb.)
1 pound (lb.) = 16 ounces (oz.)

Some Things to Do

1. Fill a pint cup with water and lift the cup. The water in the cup weighs about 1 pound.

2. Mark off on the school yard an area 4 feet square. At each corner of the square drive a stake so that the top of the stake will be just 2 feet from the ground after the stake is driven. Tie strings from the top of one stake to the top of another until you make a square of string at the top just like the square drawn on the ground. Imagine that this is a box or tank full of water. The water would weigh just 1 ton.

Find the difference between each of these pairs of numbers:

1. 10126 and 9997. 2. 7329 and 1996. 3. 1334 and 767.

4. Mr. Carter buys apples in the country and sells them in the city. Yesterday he bought apples from five orchards. He bought 78 barrels of apples from orchard A, 157 barrels from orchard B, 219 barrels from orchard C, 85 barrels from orchard D, and 168 barrels from orchard E. How many barrels of apples did Mr. Carter buy yesterday?

3. Find several things that are about as heavy as a pint cup of water and note how large they are. How large a stone does it take to weigh a pound? How large a piece of coal? How large a block of wood? Can you find a piece of lead that weighs 1 pound?

4. Get someone to lend you an ounce bottle. How many bottlefuls of this size should it take to make a pint? Try with water and see if this is true.

5. A pail which contains $2\frac{1}{2}$ gallons of water weighs about 20 pounds. If you were carrying water in a pail of this sort, you would have to make 100 trips in order to carry enough water to fill the space shown in example 2. You would need one hundred $2\frac{1}{2}$-gallon pails to hold 1 ton of water.

6. *a.* How many pounds are there in $\frac{1}{2}$ ton?
b. How many pounds are there in $\frac{1}{4}$ ton?
c. How many pounds are there in $\frac{1}{8}$ ton?
d. How many pounds are there in $\frac{1}{10}$ ton?

Multiply:

1	2	3	4	5
9542	245	9546	237	7321
78	789	79	30	79

6. How many 1-inch lengths of ribbon can be cut from a piece of ribbon 13 yards and 33 inches long?

7. Grace Kane can walk to school in 20 minutes. She lives exactly 1 mile from the schoolhouse. How many feet does Grace walk per minute on the average?

7. *a*. How many ounces are there in $\frac{1}{2}$ pound?
b. How many ounces are there in $\frac{1}{4}$ pound?
c. How many ounces are there in $\frac{1}{8}$ pound?
d. How many ounces are there in 2 pounds?

8. Tell how many pounds and ounces there are in each of these amounts:

a. 20 ounces
b. 34 ounces
c. 88 ounces
d. 24 ounces
e. 44 ounces
f. 50 ounces
g. 27 ounces
h. 75 ounces

9. Tell how many tons and pounds there are in each of these amounts of coal:

a. 3250 pounds
b. 4725 pounds
c. 6000 pounds
d. 2750 pounds
e. 5275 pounds
f. 7200 pounds
g. 3780 pounds
h. 3000 pounds

---

1. At 60 miles per hour how long will it take to go 1740 miles?

2. Find the quotient of $793 \div 3$.

3. A lot is 20 yards wide and 40 yards long. How many square feet does it contain?

4. Elizabeth Groves is away from home at school. When she left home, her father gave her $342.00 to spend. How long will Elizabeth's money last if she spends $6.00 per week?

5. Which is larger, a rug that is 45 inches by 45 inches or one that is 54 inches by 36 inches? How much larger?

How to Measure Time

Sometimes we want to know how long it is from one time to another. Copy the following facts about time in your notebook or tablet for reference. Memorize them as soon as possible.

1 minute (min.) = 60 seconds (sec.)
1 year (yr.) = 12 months (mo.)
1 week (wk.) = 7 days (da.)
1 hour (hr.) = 60 minutes (min.)
1 day (da.) = 24 hours (hr.)
1 business month (mo.) = 30 days (da.)
1 business year (yr.) = 360 days (da.)

Some Things to Do

1. Ask someone to show you a watch with a second hand. The little hand goes all the way around in 60 seconds, or 1 minute. See if you can sit perfectly still for 1 minute.

Subtract:

1	2	3	4	5
8653	9789	11667	1075	1234
754	800	9500	860	789

6. Mr. Rhodes and his family live in a large city. They spend $178.50 a month for living expenses. What is their average expense per day?

2. Look at the school clock. Which is the minute hand? See how long you can study without stopping. Can you study as long as it takes the minute hand to go all the way around?

3. See if you can tell how long it takes the hour hand to go all the way around.

4. There are 24 hours in a day. How many times does the hour hand go around in this length of time?

5. *a*. How many minutes are there in $\frac{1}{2}$ hour?
   b. How many minutes are there in $\frac{1}{3}$ hour?
   c. How many minutes are there in $\frac{1}{4}$ hour?
   d. How many minutes are there in $\frac{1}{5}$ hour?

6. *a*. How many minutes are there in $\frac{1}{6}$ hour?
   b. How many minutes are there in $\frac{1}{10}$ hour?
   c. How many minutes are there in $\frac{1}{12}$ hour?
   d. How many days are there in $\frac{1}{2}$ year?

7. *a*. How many days are there in $\frac{1}{3}$ year?
   b. How many days are there in $\frac{1}{4}$ year?
   c. How many days are there in $\frac{1}{5}$ year?
   d. How many days are there in $\frac{1}{6}$ year?

---

1. 58476 is how many times 6?

2. How many quarts are there in 456 gallons?

3. There are 8742 hours in 1 year. How many minutes are there in 1 year?

4. Kate Smith is a clerk at a counter in a large store. She sells fancy serving plates for \$8.42 each. How many plates must she sell in order to take in \$67.36?

8. *a.* How many days are there in $\frac{1}{8}$ year?
   b. How many days are there in $\frac{1}{10}$ year?
   c. How many days are there in $\frac{1}{9}$ year?
   d. How many days are there in $\frac{1}{2}$ month?

9. *a.* How many weeks are there in 42 days?
   b. How many minutes are there in 540 seconds?
   c. How many days are there in 144 hours?
   d. How many hours are there in 360 minutes?

10. *a.* How many seconds are there in 10 minutes?
    b. How many minutes are there in 300 seconds?
    c. How many seconds are there in $\frac{3}{5}$ minute?
    d. How many seconds are there in $\frac{5}{6}$ minute?

Practice Exercises

1. Mrs. Miles bought goods as follows on December 20:

1 velvet rug	$24.95
1 wrist watch	16.98
1 bracelet	18.75
1 mesh bag	3.98
1 berry spoon	1.75

Find the total amount of her bill.

2. Mrs. Tracy has $10.50. If she spends $5.25, how much money will she have left?

3. If each person in a family of 8 drinks 1 quart of milk per day, how many quarts will the family need in 30 days?

4. Blankets for beds are usually $2\frac{1}{3}$ yards long. How many feet are there in $2\frac{1}{3}$ yards?

5. How much is $1000 + 456$?

6. How many times are 9 cents contained in 81 cents?

7. How many quarts are there in 1 gallon of maple sirup?

8. Mr. Barnes travels in his car and sells goods. This morning the speedometer on his car registered 8778. Tonight it registers 8910. How many miles has Mr. Barnes driven today?

9. Seven persons are going on a picnic. The expenses will be $6.93. How much should each person pay if they all share equally?

10. Forty-five cents are how many times 9 cents?

11. How many quarts are there in 27 gallons?

12. How many quarts are there in 65 pecks?

13. When Alice Briggs got the whooping cough she weighed 72 pounds. When she got well she had lost $\frac{1}{9}$ of her weight. How much did Alice weigh when she got well?

14. How many hours are there in 90 minutes?

15. How many feet are there in 20 yards?

16. How many inches are there in 24 feet?

17. How many ounces are there in 21 pounds?

18. How many feet are there in a quarter of a mile?

CHAPTER III

MORE ABOUT FRACTIONS

With your pasteboard squares build a rectangle of 3 rows and 8 columns. Each row will contain $\frac{1}{3}$ of 24 squares. Two rows will contain $\frac{2}{3}$ of 24 squares. Can you tell how many $\frac{2}{3}$ of 24 are? Each column will contain $\frac{1}{8}$ of 24 squares. Two columns will contain $\frac{2}{8}$ of 24 squares and 3 columns will contain $\frac{3}{8}$ of 24 squares. How many are $\frac{2}{8}$ of 24? $\frac{3}{8}$ of 24? See if you can tell how many $\frac{5}{8}$ of 24 are. How many are $\frac{7}{8}$ of 24?

In any fraction the part above the line is called the **numerator.** The part below the line is called the **denominator.** When you use squares, the numerator tells you how many rows to use and the denominator tells how many rows there are all together.

Suppose you did not have pasteboard squares or that you did not have time to use them. There are two ways to find $\frac{7}{8}$ of 24 without squares.

The first way is

$$\frac{7}{8} \text{ of } 24 = \frac{7 \times 24}{8} = \frac{168}{8} = 21.$$

You can always rewrite your exercise in this way. Change the "of" to $\times$. Put the numerator 7 and the whole number 24 above the line, and the denominator 8 below. You always multiply what is above the line and divide

the product that you get by what is below the line. In the fraction $\frac{168}{8}$ the line tells us that we are to think of 168, the numerator, divided by 8, the denominator.

The second way is

$$\frac{7}{8} \text{ of } 24 = \frac{7}{\cancel{8}} \times \overset{3}{\cancel{24}} = 21.$$

In this method you change the "of" to $\times$. Then you divide the whole number by the denominator of the fraction, and you draw a line through, or cancel, each number, and just above the whole number you write what you get when you divide. Then you multiply the two numbers left above the line. Drawing lines through numbers like this is called **cancellation.** You often cancel a number below the line with a number above the line.

Which method do you prefer? The second one fails to work sometimes. You can always use the first one. Either method will do in the following examples. You may take your choice.

Find the answers to the following examples, using your pasteboard squares if you need them:

1. Find $\frac{2}{3}$ of each of the following numbers:
   15, 27, 12, 24, 9, 21, 6, 18, 3.

2. Find $\frac{3}{4}$ of each of the following numbers:
   20, 4, 24, 8, 28, 12, 32, 16, 36.

3. Find $\frac{2}{5}$, $\frac{3}{5}$, and $\frac{4}{5}$ of each of the following numbers:
   20, 30, 15, 35, 40, 5, 45, 10.

4. Find $\frac{5}{6}$ of each of the following numbers:
   18, 42, 12, 48, 6, 54, 30, 24, 36.

5. Find $\frac{3}{8}$, $\frac{5}{8}$, and $\frac{7}{8}$ of each of the following numbers:

72, 32, 64, 24, 56, 16, 48, 8, 40.

6. *a.* How many hours are there in $\frac{3}{8}$ of a day?

b. How many inches in $\frac{3}{4}$ of a foot?

c. How many quarts in $\frac{1}{4}$ of a peck?

d. How many pints in $\frac{1}{2}$ of a gallon?

e. How many square inches in $\frac{3}{16}$ of a square foot?

7. *a.* How many cubic feet in $\frac{7}{9}$ of a cubic yard?

b. How many ounces in $\frac{7}{8}$ of a pound?

c. How many minutes in $\frac{3}{4}$ of an hour?

d. How many feet in $\frac{3}{10}$ of a mile?

e. How many pecks in $\frac{3}{4}$ of a bushel?

8. *a.* How many pints in $\frac{5}{8}$ of a gallon?

b. How many acres in $\frac{3}{4}$ of a square mile?

c. How many cubic inches in $\frac{5}{16}$ of a cubic foot?

d. How many pounds in $\frac{7}{10}$ of a ton?

e. How many weeks in $\frac{3}{4}$ of a year?

9. *a.* How many feet in $\frac{2}{3}$ of a yard?

b. How many pints in $\frac{1}{2}$ of a quart?

c. How many square yards in $\frac{5}{8}$ of an acre?

d. How many days in $\frac{4}{7}$ of a week?

e. How many inches in 1 yard? in $\frac{5}{6}$ of a yard?

10. *a.* How many square feet in $\frac{4}{9}$ of a square yard?

b. How many seconds in $\frac{3}{4}$ of a minute?

c. How many yards in $\frac{3}{4}$ of a mile?

d. One acre contains 160 square rods. How many square rods are there in $\frac{3}{8}$ of an acre?

e. There are 320 rods in a mile. How many rods are there in $\frac{5}{8}$ of a mile?

Changing Fractions to Their Lowest Terms

Sometimes your answers will be like this: $\frac{2}{4}$, $3\frac{2}{6}$, $1\frac{6}{8}$. In such cases your teacher may ask you to change the form of the fractions. The denominator and numerator are called the terms of the fraction. We generally put answers into terms which are as small as possible. This is called **changing fractions to their lowest terms.**

Some Things to Do

1. Put 32 pasteboard squares on your desk in 4 rows and 8 columns. Each row will contain $\frac{1}{4}$ of 32, or 8 squares. Two rows will contain $\frac{2}{4}$ of 32, or 16 squares. Now find what $\frac{1}{2}$ of 32 is. Are $\frac{2}{4}$ and $\frac{1}{2}$ the same or different?

2. Put 24 squares in 3 rows and 8 columns. Find $\frac{4}{8}$ of 24. Now find $\frac{1}{2}$ of 24. Are $\frac{4}{8}$ and $\frac{1}{2}$ the same or different?

3. Put 24 squares in 6 rows and 4 columns. Find out something about $\frac{2}{6}$ and $\frac{1}{3}$; about $\frac{4}{6}$ and $\frac{2}{3}$.

4. Put 48 squares in 8 rows and 6 columns. Find out something about $\frac{2}{8}$ and $\frac{1}{4}$; about $\frac{6}{8}$ and $\frac{3}{4}$.

5. Put 36 squares in 9 rows and 4 columns. Find out something about $\frac{1}{3}$ and $\frac{3}{9}$; about $\frac{2}{3}$ and $\frac{6}{9}$.

A Shorter Way to Change Fractions

Can you change fractions to their lowest terms without using the pasteboard squares? This is the way to do it:

1 2 3 4

$2\overline{)\frac{2}{4}} = \frac{1}{2}$ $3\overline{)\frac{3}{6}} = \frac{1}{2}$ $2\overline{)\frac{4}{6}} = \frac{2}{3}$ $2\overline{)\frac{6}{8}} = \frac{3}{4}$

In example 1 we divide both the numerator and the denominator by 2 and write the quotients. We put 1 above the line to show that there is 1 two in 2. We write 2 below the line because there are 2 two's in 4. The quotient in the numerator is the numerator of the answer, and the quotient in the denominator is the denominator of the answer.

Example. Change $\frac{12}{18}$ to its lowest terms.

$$2 \left| \frac{12}{18} = \frac{6}{9} \right. \qquad 3 \left| \frac{6}{9} = \frac{2}{3} \right.$$

We divide both terms of the fraction by 2, thus getting $\frac{6}{9}$. Then we divide both terms of $\frac{6}{9}$ by 3, getting $\frac{2}{3}$, which is the right answer.

The examples that follow are worked in the same way, but the numbers are different. You always divide both terms by the same number.

Change each of these fractions to its lowest terms:

	(1)	(2)	(3)	(4)
(*A*)	$\frac{8}{10}$	$\frac{6}{18}$	$\frac{8}{12}$	$\frac{2}{10}$
(*B*)	$\frac{10}{12}$	$\frac{4}{10}$	$\frac{5}{15}$	$\frac{9}{12}$
(*C*)	$\frac{8}{14}$	$\frac{2}{20}$	$\frac{12}{16}$	$\frac{10}{16}$
(*D*)	$\frac{10}{15}$	$\frac{6}{24}$	$\frac{12}{18}$	$\frac{9}{18}$
(*E*)	$\frac{8}{16}$	$\frac{4}{16}$	$\frac{18}{24}$	$\frac{16}{24}$

The following facts are very important. Copy them in your tablet or notebook for reference and memorize them as soon as you can.

$\frac{2}{2}, \frac{3}{3}, \frac{4}{4}, \frac{5}{5}$, etc. are each the same as 1.
$\frac{2}{4}, \frac{3}{6}, \frac{4}{8}, \frac{5}{10}$, are each the same as $\frac{1}{2}$.
$\frac{2}{6}, \frac{3}{9}, \frac{4}{12}, \frac{5}{15}$, are each the same as $\frac{1}{3}$.
$\frac{2}{8}, \frac{3}{12}, \frac{4}{16}, \frac{5}{20}$, are each the same as $\frac{1}{4}$.
$\frac{2}{10}, \frac{3}{15}, \frac{4}{20}, \frac{5}{25}$, are each the same as $\frac{1}{5}$.
$\frac{2}{12}, \frac{3}{18}, \frac{4}{24}$, are each the same as $\frac{1}{6}$.
$\frac{2}{16}, \frac{3}{24}, \frac{4}{32}$, are each the same as $\frac{1}{8}$.
$\frac{4}{6}, \frac{6}{9}, \frac{8}{12}, \frac{10}{15}$, are each the same as $\frac{2}{3}$.
$\frac{6}{8}, \frac{9}{12}, \frac{12}{16}, \frac{15}{20}$, are each the same as $\frac{3}{4}$.

Practice Exercises

Find the difference between each of these pairs of numbers:

1	2	3	4	5
22189	1013	6644	1214	12121
5543	897	1671	605	3222

6. There are 38 pigs in one field, 37 in another field, and 9 in another. How many pigs are there in all?

7. Charles Bates has 99 cents. He wishes to buy a harmonica for 89 cents. How much money will he have left if he buys it?

8. How much is $\frac{1}{2}$ of 16 inches?

9. How many sweaters can be purchased for $189.00 if one sweater costs $7.00?

10. If Henry Rolfe can mow 3 lawns in 1 day, how many lawns can he mow in 6 days?

11. Marguerite Williams wants to buy a doll that costs 59 cents, but she has only 56 cents. How many more cents does Marguerite need?

12. During the summer Mary Barnes worked and earned money. She earned \$18.75 by selling tickets at a motion-picture theater, \$5.83 by caring for a baby that lived next

door to her home, \$2.55 by running errands, and \$3.87 by gathering eggs and selling them. How much money did Mary earn in all during the summer?

Naming Parts, or Fractions

Sometimes we have only part of a thing or a group of things and we need to know how large this part is. For example, Mary found 9 eggs today. Eggs sell by the dozen and Mary wants to know what part of a dozen she has found. How can she find out? Here is one way. She can get 12 pasteboard squares and place them in 4 rows and 3 columns. Each row will contain $\frac{1}{4}$ of 12 squares. How many rows will it take to contain 9 squares? Each of these rows represents $\frac{1}{4}$ of 12. Three of them taken together will represent $\frac{3}{4}$ of 12. Therefore 9 is $\frac{3}{4}$ of 12, and Mary found $\frac{3}{4}$ of a dozen eggs today.

Some Problems to Solve with Squares

The larger number in each problem tells the number of squares to put in the whole rectangle. The smaller number tells the number of squares to put in each row. Change the answers to their lowest terms if necessary.

1. William went down to the store to buy a peck of potatoes. What part of 4 pecks is that?

2. John is a very little boy. He can jump only 2 feet. What part of 3 feet is that?

3. James Robbins plans to shell half a bushel of corn every Saturday, so that he won't have to shell any on the days when he is going to school. It is now Saturday noon and James has shelled 12 pounds of corn. If a half-bushel of corn weighs 28 pounds, what part of James's work is finished? How many more pounds must he shell? What part of it must he do this afternoon? (Make your rectangle 4 squares by 7 squares.)

Find the sums:

1	2	3	4
1690	9567	9789	
7491	1745	7888	8979
7869	1622	3972	7999
4747	5371	1629	5248
5369	2828	5091	1131
9636	1079	8002	3982
1215	7067	4005	9709

5. What will 36 pounds of coffee cost at 56 cents per pound?

4. Mary wants to make some badges out of ribbon. If the badges are 4 inches long, what part of 12 inches will the length of each badge be?

5. Mary Anderson has promised her music teacher to practice 1 hour every day. At supper time Mary had practiced only 35 minutes. What part of the hour is this? How many more minutes must she practice? What part of an hour must Mary practice after supper if she intends to keep her promise? (Make your rectangle 5 squares by 12 squares.)

6. William Jones can hardly wait until Christmas morning. William expects to get up at 7 o'clock that morning, and it is just 63 hours from now until that time. If William sleeps 30 hours of this time, what part of the 63 hours will he sleep? He will spend about 3 hours eating. What part of the time will he eat? If he spends 6 hours shopping and going on errands, what part of the 63 hours will this be? (Make your rectangle 3 squares by 21 squares.)

---

1. A train runs 32 miles per hour. At that rate how long will it take the train to run 96 miles?

2. Barbara Jones saved $15.78 in 6 weeks. How much did Barbara save per week on the average?

3. How many 1-inch lengths of ribbon can be cut from a piece of ribbon 1 foot 7 inches long?

4. How much money is $519.00 and $726.00?

5. William Roach had 93 cents and spent 47 cents. How many cents did William have left?

7. Jane Austin is awake 14 hours every day. If she is in school 6 hours, what part of the 14 hours does she spend in school? She studies at home and practices music for 2 hours. What part of the 14 hours does she study at home and practice? She takes care of the baby one hour every day. What part of the 14 hours is this? She spends the remainder of the 14 hours playing and eating. What part of 14 hours is this?

8. A spool of ribbon usually has 10 yards on it. After closing hours Saturday night Mr. Wilson, the merchant, finds that 6 yards of ribbon were sold from the spool during the day. What part of the ribbon is left on the spool?

9. Mrs. Adams buys berries by the crate. A crate usually contains 24 boxes of berries. Today she received a crate with 3 boxes that were spoiled. What part of the crate was good?

Multiply:

1	2	3	4
345679	24862	67894	6489
10	756	34	327

5. Our baseball team of 9 players went on a trip. The railroad fare for all the players was $2.43. What was the fare for each member of the team?

6. A grocer had 2 cases of baked beans. Each case contained 24 cans of beans. Two days after the beans came he had 33 cans left. How many cans of beans had he sold?

10. Baby drinks 8 ounces of milk for breakfast. What part of 16 ounces is that?

Can you answer "what part of" questions without using squares? Here is one way to do it.

Example. What part of 16 is 12? Make a fraction of these two numbers. Take the larger number for the denominator and the smaller number for the numerator. Change the fraction to its lowest terms if necessary.

$$4\left|\frac{12}{16}=\frac{3}{4}\right.$$ Hence 12 is $\frac{3}{4}$ of 16.

Find $\frac{3}{4}$ of 16. Do you get 12?

Tell what part of a yard each of the following is:

	(1)	(2)	(3)	(4)	(5)
(*A*)	24 in.	18 in.	9 in.	16 in.	30 in.
(*B*)	20 in.	15 in.	6 in.	4 in.	28 in.

1. If 3 coats cost $25.92, what is the average cost per coat?

2. It is the berry-picking season. Alice Coates picked 32 quarts during the first day. At that rate how many quarts of berries can Alice pick in 14 days?

3. Mr. Harlan runs a candy store. He has 35 boxes of candy, each containing 7 pieces. How many pieces of candy are there in all 35 boxes?

4. Find the total weight of these loads of coal:

Load A	2160 lb.
Load B	1996 lb.
Load C	1988 lb.
Load D	1970 lb.

Problem. Fred's garden is 50 feet wide and 60 feet long. Counting an acre as 43,560 square feet, find what part of an acre Fred's garden contains.

$50 \times 60 = 3000$ (square feet in Fred's garden)

$$10 \left| \frac{3000}{43560} = \frac{300}{4356} \right. \qquad 3 \left| \frac{300}{4356} = \frac{100}{1452} \right.$$

$$2 \left| \frac{100}{1452} = \frac{50}{726} \right. \qquad 2 \left| \frac{50}{726} = \frac{25}{363} \right.$$

We divide both terms of the fraction first by 10. Then we divide both terms of the resulting fraction by 3. We go on dividing until we get $\frac{25}{363}$. There is no number other than 1 by which we can divide both 25 and 363 without a remainder, and so $\frac{25}{363}$ is the answer.

In the exercises that follow you will have to decide what numbers to divide both terms of the fraction by in order to change it to lower terms. You will need the rules that follow to help you. Copy them in your tablet or workbook for reference.

Rules that Will Help You in Changing Fractions to Their Lowest Terms

You can always divide by 2 when a number ends in 0, 2, 4, 6, or 8.

You can always divide a number by 3 if the sum of the figures in it can be divided by 3. For example, 1863 can be divided by 3 because $1 + 8 + 6 + 3 = 18$, and you know that 18 can be divided by 3. You cannot divide 742 by 3 because $7 + 4 + 2 = 13$, and you cannot divide 13 by 3 without a remainder.

You can always divide a number by 5 when the number ends in 0 or 5.

You can always divide a number by 10 if it ends in 0.

Problems to Solve without Using Your Squares

1. The children of the Washington School have a lot 90 feet long and 40 feet wide for their school garden. What part of an acre is that?

2. David Jones is in the fourth grade and is still too little to hoe in the garden very long at a time. He has to

rest very often. Three days before the circus came to town David's father promised to give him enough money to see it all if he would hoe the whole garden before the circus arrived. The garden is 45 feet long and 30 feet wide. On the first day, fearing it would rain, David hoed a rectangular area 20 feet by 30 feet. On the second day he hoed an area 20 feet by 20 feet. On the third day he finished the rest of the garden. What part of the garden

did he hoe the first day? What part the second day? What part did he finish on the last day?

3. The blocks in our town are 440 feet long. A square block is an area one block square. What part of a square block is a lot 60 feet wide and 80 feet deep?

4. Mr. Smith's yard is 50 feet long and 40 feet wide. James Finley promised to mow Mr. Smith's lot on Saturday. By noon an area of grass 20 feet long and 10 feet wide was still left to mow. What part of the lawn must James mow Saturday afternoon if he keeps his promise?

5. Two brothers, William and James Wallace, bought a radio set for $35. William paid $20 and James paid $15. What part of the set belongs to William? What part does James own?

6. The gasoline tank in Mr. Allen's car holds 15 gallons of gasoline. If a barrel of gasoline contains 51 gallons, what part of a barrel can Mr. Allen put into his car at one time?

7. Our coal bin is empty and we are planning to put 10 tons of coal in it. Mr. Larson hauls the coal. His horses can pull a load of 3600 pounds. How many full loads will he have to haul? What part of a load will be left over?

8. Mr. Carter and his family are driving to see Mr. Carter's brother, who lives 750 miles away. If they drive 200 miles per day, how many full days will it take them? What part of a day's drive will be left over?

9. John promised his teacher that he would read a book containing 200 pages. He has read 75 pages. What part of the book has he yet to read?

Practice Exercises

Answer these without using your pencil:

	(1)	(2)	(3)	(4)
(*A*)	$23 + 2 = ?$	$30 + 8 = ?$	$31 + 2 = ?$	$26 + 6 = ?$
(*B*)	$29 + 8 = ?$	$26 + 3 = ?$	$30 + 6 = ?$	$26 + 2 = ?$
(*C*)	$30 + 7 = ?$	$28 + 7 = ?$	$27 + 3 = ?$	$40 + 2 = ?$
(*D*)	$49 + 1 = ?$	$19 + 2 = ?$	$45 + 2 = ?$	$49 + 2 = ?$
(*E*)	$40 + 3 = ?$	$45 + 4 = ?$	$45 + 5 = ?$	$54 + 2 = ?$
(*F*)	$45 + 8 = ?$	$42 + 6 = ?$	$54 + 3 = ?$	$48 + 2 = ?$
(*G*)	$54 + 5 = ?$	$48 + 5 = ?$	$54 + 6 = ?$	$48 + 6 = ?$
(*H*)	$56 + 2 = ?$	$54 + 7 = ?$	$56 + 3 = ?$	$63 + 2 = ?$
(*I*)	$72 + 7 = ?$	$63 + 3 = ?$	$72 + 6 = ?$	$81 + 8 = ?$

1. How many times is 35 cents contained in $3.15?

2. The big road grader passes over 15,840 feet of road in 90 minutes. What does it average per minute?

3. The total sales in a toy shop were $175.20 for one week of six days. What was the average of the sales per day?

4. Our school is planning to have a picnic. There are 204 persons in all to go. Seventy-eight of these can go in automobiles, and the remainder must go on the street car. How many persons must go on the street car?

5. $89284 \div 29 = ?$

Problems about Buying and Selling Involving Fractions

Sometimes we want to buy or sell things in small amounts. The next problem tells about a case of this sort. Notice how it is worked.

Problem. What will $\frac{3}{4}$ of a pound of beefsteak cost at 35 cents per pound?

$$\frac{3}{4} \times 35 = \frac{3 \times 35}{4} = \frac{105}{4} = 26\frac{1}{4}.$$

The answer is 27 cents. **When there is a fraction of a cent in your answer, add one more cent to the whole number.**

Problem. What will $\frac{2}{3}$ dozen eggs cost at 45 cents per dozen?

$$\frac{2}{\cancel{3}} \times \overset{15}{\cancel{45}} = 30. \qquad 30¢. \quad \textit{Ans.}$$

The following problems are to be worked in the way you have just learned. Cancel when you can.

Find the cost of each of the following purchases:

1. $\frac{1}{2}$ lb. beefsteak at 36¢ a pound.
2. $\frac{1}{4}$ lb. bolts at 25¢ a pound.
3. Eight ounces of Bordeaux mixture at 36¢ a pound.

Add the numbers in each of the columns:

1	2	3	4	5
3431		3646		9847
7694	3142	4172	4846	1134
4352	5489	4681	5263	6328
7669	3196	7839	6952	1245
6975	9334	5525	2669	1672
2468	7949	4178	9245	4645
4327	4635	1304	4058	6351
3134	2542	8611	1945	7135

4. $\frac{3}{4}$ yd. of braid at 10¢ a yard.
5. Eight buttons at 24¢ per dozen.
6. $\frac{3}{4}$ lb. of candy at 60¢ a pound.
7. $\frac{1}{2}$ dozen cans of California cherries at $4.65 a dozen.
8. $\frac{1}{2}$ lb. of coffee at 50¢ a pound.
9. $\frac{1}{2}$ yd. of silk binding at $2.48 a yard.
10. $\frac{5}{8}$ yd. of trimming at $1.68 a yard.
11. $\frac{3}{4}$ yd. of lace at 20¢ a yard.
12. Nine eggs at 40¢ a dozen.
13. $\frac{3}{8}$ yd. of embroidery at 24¢ a yard.
14. A pint of milk at 18¢ a quart.
15. $\frac{1}{4}$ lb. of boiled ham at 48¢ a pound.
16. Eight hair nets at 45¢ a dozen.
17. $\frac{3}{4}$ lb. of hamburger steak at 15¢ a pound.
18. Six linen handkerchiefs at $3.50 per dozen.
19. Nine skirt hangers at 56¢ a dozen.
20. A pint of ice cream at 60¢ per quart.

Find the remainders:

1	2	3	4	5
1210	575	1314	10978	6431
1007	122	506	4000	3536

6. There are 248 little girls in the Children's Home. Each child must have 3 dresses. How many dresses are needed in all?

7. Seventy-five cents is how many times 5 cents?

21. Four milk bottles at 95¢ a dozen.

22. Eight napkins at $2.90 per dozen.

23. Nine sewing needles at 18¢ per dozen.

24. $\frac{1}{4}$ lb. of Paris green at 36¢ a pound.

25. $\frac{3}{4}$ lb. of potato chips at 48¢ per pound.

26. $\frac{5}{8}$ yd. of ribbon at 48¢ a yard.

27. $\frac{3}{8}$ lb. of rivets and burrs at 30¢ a pound.

28. $\frac{1}{2}$ lb. of salmon at 36¢ per pound.

29. $\frac{3}{4}$ lb. of sausage at 25¢ per pound.

30. Nine pairs of shoe laces at 90¢ per dozen pairs.

31. $\frac{1}{2}$ lb. of sugar at 10¢ a pound.

32. $\frac{3}{4}$ lb. of tea at 40¢ per pound.

33. $\frac{1}{2}$ dozen cans of tomatoes at $1.50 per dozen.

34. $\frac{1}{2}$ pk. of potatoes at 26¢ a peck.

35. $\frac{1}{2}$ pt. of cream at 28¢ a pint.

36. $\frac{3}{4}$ lb. of asparagus at 36¢ a pound.

Find these products:

1	2	3	4
76486	45879	21975	27564
756	468	56	87

5. Mr. Hastings has $178.00. He has just spent $884.00. How much money did he have at first?

6. Susan Thorp has a flower bed which is 9 feet square. How many square feet are in Susan's flower bed?

Some Different Kinds of Fractions

Most of the fractions that we have had thus far have had numerators which were less than their denominators. Such fractions are called **proper** fractions. If the numerator is equal to or greater than the denominator, the fraction is called an **improper** fraction. In the exercise worked out on page 62 we had the fraction $\frac{168}{8}$. This is the only improper fraction that we have had. The numerator 168 is more than the denominator 8. Fractions like $\frac{2}{2}$, $\frac{3}{3}$, $\frac{4}{4}$, and the like are also called improper fractions, because the numerator is equal to the denominator.

Changing Improper Fractions

Sometimes the answer to an exercise will turn out to be an improper fraction. If such is the case, we generally change the improper fraction to something else that means the same but looks different. We can change improper fractions either into whole numbers or into whole numbers and proper fractions. When the answer was $\frac{168}{8}$, we changed the $\frac{168}{8}$ into 21, because the line between the numerator and the denominator told us to divide, and 168 divided by 8 gave us 21.

1. Our village park contains 2 acres. The city park contains 68 acres. How much larger is the city park?

2. How many 8-cent articles can you buy for $1.12?

3. Find the quotient: $452\overline{)785694}$

4. How long does it take to go 875 miles at the rate of 35 miles per hour?

But suppose we get $\frac{9}{2}$ for an answer. The line between the numerator and the denominator still means divide. When 9 is divided by 2 the result, or quotient, is 4, and one half over. We write this $4\frac{1}{2}$. This means four and one half. We leave out the "and" in writing to save time, but always pronounce it in reading. A whole number and a fraction together is called a **mixed number**. We change improper fractions to mixed numbers when we divide the numerator by the denominator and have something left. Before this we have been writing a + sign to show a remainder. From now on, for a while, we shall write the quotient as a mixed number.

Change the following improper fractions into whole or mixed numbers:

	(1)	(2)	(3)	(4)	(5)
(*A*)	$\frac{10}{2}$	$\frac{48}{6}$	$\frac{11}{3}$	$\frac{25}{16}$	$\frac{20}{5}$
(*B*)	$\frac{18}{5}$	$\frac{17}{8}$	$\frac{24}{8}$	$\frac{13}{2}$	$\frac{17}{6}$

Find the differences:

1	2	3
8125	1217	779
6667	787	234

Get the answers to these:

4	5	6	7
$786 \times 79 = ?$	$86985 \times 8 = ?$	$395 \times 84 = ?$	$97758 \times 9 = ?$

8. How many pounds are there in $\frac{4}{5}$ of a ton?
9. How many square rods are there in 80 acres?
10. How many cubic inches are there in $\frac{7}{8}$ of a cubic foot?

Easy Exercises in the Addition of Fractions

If fractions have the same denominators, we can add them much as we do whole numbers. Thus three fourths and one fourth equal four fourths, or, writing this in figures, $\frac{3}{4} + \frac{1}{4} = \frac{4}{4}$.

Two thirds and two thirds equal four thirds, or $\frac{2}{3} + \frac{2}{3} = \frac{4}{3}$.

Three fifths and four fifths are equal to seven fifths, or $\frac{3}{5} + \frac{4}{5} = \frac{7}{5}$.

We merely add the numerators and write in or name the denominator, and we change the answers to whole or mixed numbers, if necessary.

Add the following fractions without using pencil and paper:

	(1)	(2)	(3)	(4)	(5)
(*A*)	$\frac{4}{7}$	$\frac{1}{2}$	$\frac{5}{6}$	$\frac{7}{9}$	$\frac{3}{8}$
	$\frac{5}{7}$	$\frac{1}{2}$	$\frac{4}{6}$	$\frac{5}{9}$	$\frac{5}{8}$
(*B*)	$\frac{4}{6}$	$\frac{7}{8}$	$\frac{7}{10}$	$\frac{11}{16}$	$\frac{7}{24}$
	$\frac{3}{6}$	$\frac{4}{8}$	$\frac{9}{10}$	$\frac{15}{16}$	$\frac{17}{24}$

1. The cost of making and selling a certain quantity of sandwich bread is $350.00. The bread sells at 20 cents a loaf. How many loaves must be sold to equal the cost?

2. At the beginning of Mr. Gaines's vacation the speedometer on his car registered 356. At the end of his vacation it registered 1767. How many miles did Mr. Gaines drive during his vacation?

3. How many rows will be needed if 270 trees are to be planted 10 in a row?

Easy Addition of Whole and Mixed Numbers

Review

First add the fractions, then add the whole numbers. Change the fractions in the answers to lowest terms when necessary.

	(1)	(2)	(3)	(4)	(5)
(*A*)	$10\frac{3}{8}$	$6\frac{1}{3}$	9	$13\frac{1}{9}$	$15\frac{1}{12}$
	2	$2\frac{1}{3}$	$24\frac{1}{5}$	$5\frac{2}{9}$	$20\frac{5}{12}$
	$6\frac{1}{8}$	3	16	29	18
	$4\frac{3}{8}$	4	$5\frac{3}{5}$	$6\frac{4}{9}$	$12\frac{1}{12}$
(*B*)	$9\frac{1}{4}$	$25\frac{3}{16}$	$12\frac{1}{2}$	$2\frac{1}{7}$	$120\frac{1}{24}$
	16	$17\frac{5}{16}$	13	$13\frac{2}{7}$	$89\frac{5}{24}$
	$8\frac{1}{4}$	$9\frac{3}{16}$	19	$19\frac{3}{7}$	$141\frac{7}{24}$
	30	$21\frac{1}{16}$	23	8	$75\frac{5}{24}$

1. How many weeks are there in 567 days?

2. $9 \times 4750 = ?$

3. How many pounds are there in 97808 ounces?

4. How many gallons are there in 3216 quarts?

5. Elsie Banks has $260.00 to spend. How long will this money last if Elsie spends $5.00 per week?

6. Divide 24782 by 75.

7. $89284 \div 29 = ?$

8. Mr. Doe bought 15 cartons of baked beans for his store. There were 24 cans in each carton. How many cans of beans did Mr. Doe buy?

Changing Improper Fractions to Mixed Numbers

Review

Change these fractions to mixed numbers. Do not use your pencil or paper unless you have to. Do not write in your book.

	(1)	(2)	(3)	(4)	(5)	(6)
(*A*)	$\frac{3}{2} = ?$	$\frac{13}{6} = ?$	$\frac{7}{5} = ?$	$\frac{5}{3} = ?$	$\frac{9}{4} = ?$	$\frac{9}{5} = ?$
(*B*)	$\frac{5}{2} = ?$	$\frac{9}{8} = ?$	$\frac{4}{3} = ?$	$\frac{5}{4} = ?$	$\frac{8}{5} = ?$	$\frac{7}{3} = ?$
(*C*)	$\frac{8}{7} = ?$	$\frac{7}{6} = ?$	$\frac{6}{5} = ?$	$\frac{7}{4} = ?$	$\frac{9}{7} = ?$	$\frac{19}{16} = ?$
(*D*)	$\frac{17}{12} = ?$	$\frac{27}{16} = ?$	$\frac{19}{12} = ?$	$\frac{17}{16} = ?$	$\frac{23}{12} = ?$	$\frac{19}{8} = ?$
(*E*)	$\frac{29}{16} = ?$	$\frac{17}{8} = ?$	$\frac{13}{12} = ?$	$\frac{11}{6} = ?$	$\frac{10}{7} = ?$	$\frac{13}{8} = ?$
(*F*)	$\frac{12}{7} = ?$	$\frac{10}{9} = ?$	$\frac{11}{8} = ?$	$\frac{11}{7} = ?$	$\frac{15}{8} = ?$	$\frac{13}{7} = ?$
(*G*)	$\frac{11}{9} = ?$	$\frac{21}{16} = ?$	$\frac{14}{9} = ?$	$\frac{21}{8} = ?$	$\frac{17}{9} = ?$	$\frac{23}{16} = ?$
(*H*)	$\frac{13}{9} = ?$	$\frac{25}{16} = ?$	$\frac{31}{16} = ?$	$\frac{16}{9} = ?$	$\frac{39}{16} = ?$	$\frac{45}{16} = ?$

Change these fractions to mixed numbers or whole numbers. Be sure to change your answer to its lowest terms. Write on your tablet, if necessary. Do not write in your book.

	(1)	(2)	(3)	(4)
(*A*)	$\frac{6}{4} = ?$	$\frac{4}{2} = ?$	$\frac{7}{7} = ?$	$\frac{6}{3} = ?$
(*B*)	$\frac{8}{8} = ?$	$\frac{5}{5} = ?$	$\frac{6}{6} = ?$	$\frac{8}{4} = ?$

1. How many days are there in 52 weeks?
2. How many inches are there in 80 feet?
3. How many ounces are there in 5 pounds of sweet chocolate?
4. How many feet are there in 85 miles?
5. How many square rods are there in 640 acres?
6. $5 \times 1200 = ?$

	(1)	(2)	(3)	(4)
(C)	$\frac{9}{6} = ?$	$\frac{4}{4} = ?$	$\frac{18}{8} = ?$	$\frac{3}{3} = ?$
(D)	$\frac{2}{2} = ?$	$\frac{9}{9} = ?$	$\frac{12}{6} = ?$	$\frac{8}{6} = ?$
(E)	$\frac{18}{16} = ?$	$\frac{18}{12} = ?$	$\frac{14}{6} = ?$	$\frac{16}{8} = ?$
(F)	$\frac{12}{12} = ?$	$\frac{28}{16} = ?$	$\frac{16}{12} = ?$	$\frac{15}{6} = ?$
(G)	$\frac{14}{12} = ?$	$\frac{10}{6} = ?$	$\frac{16}{16} = ?$	$\frac{22}{12} = ?$
(H)	$\frac{26}{16} = ?$	$\frac{15}{12} = ?$	$\frac{10}{8} = ?$	$\frac{15}{9} = ?$
(I)	$\frac{30}{16} = ?$	$\frac{12}{9} = ?$	$\frac{22}{16} = ?$	$\frac{20}{12} = ?$
(J)	$\frac{20}{16} = ?$	$\frac{20}{8} = ?$	$\frac{21}{12} = ?$	$\frac{12}{8} = ?$
(K)	$\frac{24}{16} = ?$	$\frac{14}{8} = ?$	$\frac{24}{12} = ?$	$\frac{32}{16} = ?$

Problems with Fractions

1. Mr. Jones has a large berry patch. He told his children, William and Alma, that they could have $\frac{1}{3}$ of the berries that they picked. On Tuesday and Wednesday William picked 39 quarts and Alma picked 33 quarts. How many quarts could each child keep?

Find the sums:

1	2	3	4	5
				7336
1300	9636			7640
9848	7003	9795		1363
3679	9112	8466	$4.90	2425
6896	6028	8885	4.84	4252
8438	4139	1988	8.74	2665
6297	675	7849	5.66	7417
2530	945	21	1.79	4542
1000	2000	432	.25	2100

2. The children took their berries to the grocery store to sell them. Alma's berries were all good ones. The grocer bought Alma's berries at 10 cents a quart. When he examined William's berries, he found so many green

ones among them that he subtracted $\frac{1}{10}$ from the amount that William would have received otherwise. How much did each child receive?

3. At a store in the neighborhood the children found a bargain sale. Everything was marked "$\frac{1}{5}$ off." This meant

---

1. Nine is what part of 18?

2. $\frac{1}{2}$ of 16 inches = ?

3. This year the enrollment at our school is 311 pupils. Last year it was only 146. How much has our enrollment increased during the year?

4. Harry Brown can read 89 pages a day. How many pages can Harry read in two days at this rate?

that each thing was being sold at $\frac{1}{5}$ less than the regular price. Here are some of the regular prices:

a. Bathing suits	$1.50
b. Berry spoons	1.30
c. Bicycle tires	1.45
d. Figs, per box	1.65
e. Flash lights	1.25
f. Handkerchiefs, for six	1.75
g. Ice-cream freezers	1.55
h. Ice tongs	1.20
i. Pruning shears	1.40

Alma had $1.10. Which of the articles above could she buy and pay for? How much money would she have left in each case?

4. William had $1.17. Which articles could he buy and pay for that Alma could not?

5. You can buy fresh fruit at $\frac{1}{8}$ off if you buy in large amounts. How much would be saved on a $12.00 order?

6. Grace sometimes helps her father in his dry-goods store. Last week her father asked her to make some new

---

1. What is the cost of 18 pounds of candy at 56 cents per pound?

2. Mr. Smith and Mr. Jones buy and sell eggs. Mr. Smith has 412 cases of eggs and Mr. Jones has 134 cases. Which man has more eggs? How many cases more?

3. Find the total of this bill:

1 broom	$2.00
1 bath robe	4.75
1 kettle	3.00
1 dish pan	1.63

tags for some goods which he planned to put on special sale at $\frac{1}{6}$ off. To start with he gave Grace this list of regular prices:

a. Purses	$1.20	*i*. Rubber boots	$3.60
b. Moccasins for baby	.60	*j*. Boxing gloves, per set	2.58
c. Bath towels	.30	*k*. Braid, 12 yds. for	.54
d. Bedspreads	2.40	*l*. Broadcloth, per yard	.66
e. Belts	.72	*m*. Calico, per yard	.18
f. Beads, per package	.48	*n*. Caps	.84
g. Belt buckles	.42	*o*. Coats	12.00
h. Blouses	1.56		

Write on your tablet what Grace should have put on each tag.

7. When Grace had finished the first list, and her father saw that it was correct, he gave her a second list to tag. This is the list:

a. Collar bags	$1.50	*i*. Rugs	$78.00
b. Crêpe de chine, per yd.	1.14	*j*. Satchels	15.00
c. Dresses	24.00	*k*. Silk, per yd.	1.98
d. Hammocks	3.84	*l*. Slippers, per pair	4.50
e. Handkerchiefs, 6 for	1.74	*m*. Suits for boys	9.60
f. Hats	6.00	*n*. Trunks	21.00
g. Hose, per pair	2.94	*o*. Parasols	9.00
h. Linoleum, per yd.	2.34		

What should Grace have put on each of these tags?

8. Eight boys in our school want to run in a relay race. They plan to run one mile (1760 yards) in all. Two boys will start at the beginning and run $\frac{1}{4}$ of the distance. Then two more of them will run another $\frac{1}{4}$ and two more another $\frac{1}{4}$ and so on until the race is finished. How many yards must each pair of boys run?

9. Eight of the girls are planning a relay race also. They plan to run 660 yards. How many yards must each girl run?

10. Three women on our street together bought a crate of cherries containing 24 quarts. Each one paid her share of the cost and received $\frac{1}{3}$ of the cherries. How many quarts was that?

11. Three men bought 30 gallons of cider. The first man took $\frac{1}{2}$ of the cider, the second $\frac{1}{3}$ of it, and the third $\frac{1}{6}$ of it. How many gallons did each man get?

---

1. Mr. Lawrence has 456 apple trees in his orchard, but 124 of them did not bear this year. How many of Mr. Lawrence's apple trees had apples on them?

2. My mother's living room is 30 feet long and 16 feet wide. How many square feet of floor space are there?

3. Mr. White has 200 bushels of corn. He has just sold 946 bushels. How many bushels of corn did he have at first?

4. Thirty children went to a picnic in a bus. The driver promised to take them all for $4.50. How much should each child pay?

5. Subtract 2023 from 6789.

6. How many weeks will $250.86 last me if I spend $8.25 per week? How much money will be left over?

7. Find the quotient: 89563 ÷ 34.

8. Which is cheaper, to buy flour in 49-pound sacks at $2.45 or the same number of pounds at 6 cents per pound?

9. How many bushels are there in 216 quarts of shelled pop corn?

Change these improper fractions to mixed numbers. Do not use your pencil unless you have to. Do not mark in your book.

	(1)	(2)	(3)	(4)	(5)	(6)
(*A*)	$\frac{13}{7} = ?$	$\frac{17}{9} = ?$	$\frac{13}{8} = ?$	$\frac{11}{6} = ?$	$\frac{11}{9} = ?$	$\frac{15}{8} = ?$
(*B*)	$\frac{11}{7} = ?$	$\frac{16}{9} = ?$	$\frac{12}{7} = ?$	$\frac{11}{8} = ?$	$\frac{13}{9} = ?$	$\frac{10}{7} = ?$
(*C*)	$\frac{10}{9} = ?$	$\frac{14}{9} = ?$	$\frac{31}{16} = ?$	$\frac{25}{16} = ?$	$\frac{21}{16} = ?$	$\frac{23}{16} = ?$

Change these improper fractions to mixed numbers. Be sure to change each answer to its lowest terms. Write on your tablet, if necessary. Do not write in your book.

	(1)	(2)	(3)	(4)	(5)	(6)
(*A*)	$\frac{30}{16} = ?$	$\frac{20}{12} = ?$	$\frac{20}{16} = ?$	$\frac{10}{6} = ?$	$\frac{12}{8} = ?$	$\frac{12}{9} = ?$
(*B*)	$\frac{21}{12} = ?$	$\frac{24}{16} = ?$	$\frac{10}{8} = ?$	$\frac{15}{9} = ?$	$\frac{14}{8} = ?$	$\frac{22}{16} = ?$

1. A box contained 5 layers of figs. Each layer had 36 rows of figs with 24 in each row. How many figs were there in the box?

2. A truck loaded with coal weighed 3412 pounds. The truck weighed 1223 pounds when empty. What did the coal weigh?

3. John Martin drove his car on a trip today. His speedometer read 569 when he started. When he returned, it read 724. How many miles did John drive?

4. A dealer bought 62 bushels of apples for $86.80. He had hoped to sell them at 55 cents per peck, but the supply of apples on the market increased so that he was forced to sell his apples at $1.45 per bushel. Did he gain or lose? How much? How much would he have gained if he had been able to sell as he had planned?

Change these improper fractions to whole or mixed numbers. Change each answer to its lowest terms, if necessary. Do not write in your book.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
(*A*)	$\frac{4}{2} = ?$	$\frac{23}{8} = ?$	$\frac{6}{3} = ?$	$\frac{18}{8} = ?$	$\frac{5}{2} = ?$	$\frac{16}{8} = ?$	$\frac{8}{3} = ?$
(*B*)	$\frac{17}{6} = ?$	$\frac{22}{8} = ?$	$\frac{7}{3} = ?$	$\frac{10}{5} = ?$	$\frac{17}{8} = ?$	$\frac{8}{4} = ?$	$\frac{20}{8} = ?$
(*C*)	$\frac{12}{6} = ?$	$\frac{11}{4} = ?$	$\frac{21}{8} = ?$	$\frac{10}{4} = ?$	$\frac{14}{5} = ?$	$\frac{15}{6} = ?$	$\frac{19}{8} = ?$
(*D*)	$\frac{11}{5} = ?$	$\frac{16}{6} = ?$	$\frac{12}{5} = ?$	$\frac{13}{6} = ?$	$\frac{13}{5} = ?$	$\frac{9}{4} = ?$	$\frac{14}{6} = ?$

More Difficult Addition of Mixed Numbers

Example. Find the sum of $21\frac{5}{8}, 43\frac{7}{8}, 19\frac{3}{8}$, and $25\frac{7}{8}$.

An example of this kind is not so difficult if we use this simple method. Adding the fractions, we get $\frac{22}{8}$; $\frac{22}{8} = 2\frac{6}{8} = 2\frac{3}{4}$. We write the $2\frac{3}{4}$ as shown at the right of the page. Then we add the whole numbers, obtaining 108. Finally we add the 108 to the $2\frac{3}{4}$, getting the answer $110\frac{3}{4}$.

$$\begin{array}{r} 21\frac{5}{8} \\ 43\frac{7}{8} \\ 19\frac{3}{8} \\ \underline{25\frac{7}{8}} \\ 2\frac{3}{4} \\ \underline{108} \\ 110\frac{3}{4} \end{array}$$

Add the numbers in each of these columns:

1	2	3	4	5
6210		5322		5300
7553	8987	5642	9889	2410
7981	2414	9953	9403	7826
2687	7356	2381	1347	3515
3479	3775	1396	5023	5446
2576	1160	5537	1361	2385
4002	9407	3129	3354	4299
3009	1237	3215	4915	4649
1002	2631	3400	2195	5612

Find the sums of the following columns:

	(1)	(2)	(3)	(4)
(*A*)	$125\frac{1}{2}$	$98\frac{5}{16}$	$119\frac{2}{3}$	$140\frac{1}{4}$
	$180\frac{1}{2}$	$25\frac{3}{16}$	$296\frac{1}{3}$	$96\frac{3}{4}$
	$99\frac{1}{2}$	$19\frac{13}{16}$	$175\frac{1}{3}$	208
	$223\frac{1}{2}$	$45\frac{11}{16}$	$90\frac{2}{3}$	$87\frac{1}{4}$
(*B*)	$248\frac{5}{6}$	$169\frac{1}{8}$	$289\frac{5}{12}$	$121\frac{1}{9}$
	$312\frac{1}{6}$	$245\frac{3}{8}$	$873\frac{1}{12}$	$302\frac{8}{9}$
	$179\frac{1}{6}$	$67\frac{5}{8}$	$560\frac{7}{12}$	$726\frac{5}{9}$
	$437\frac{5}{6}$	$192\frac{7}{8}$	$200\frac{11}{12}$	$248\frac{2}{9}$

Problems with Mixed Numbers

1. Mr. Smith hauled 6 loads of wheat to town. The loads weighed $1\frac{7}{8}$ tons, 2 tons, $1\frac{5}{8}$ tons, $2\frac{1}{8}$ tons, $1\frac{7}{8}$ tons, and $1\frac{5}{8}$ tons respectively. How many tons of wheat did Mr. Smith haul in all?

---

1. The fifth grade had a Halloween party. Fifty-nine people came to the party. The refreshments cost 19 cents per person. How much did the refreshments for the whole party cost?

2. There are 916 posts in one pile and 710 in another. How many posts are there in both piles?

3. Mabel Grimes saved 98 cents in 4 weeks. How much did Mabel save per week on the average?

4. How many feet are there in a piece of linen 47 yards long?

5. What part of 39 is 13?

6. Subtract 998 from 1315.

7. How many pounds are there in 64 ounces?

2. James bought four short pieces of 6-inch lumber of different lengths. The lumber had been left over from building a house. One piece was $4\frac{3}{4}$ feet long, another was $6\frac{1}{4}$ feet long, another was $10\frac{1}{4}$ feet long, and another was $2\frac{3}{4}$ feet long. Find the total length of all the pieces.

3. Baby James gained as follows: $2\frac{1}{16}$ pounds in January, $2\frac{3}{16}$ pounds in February, $1\frac{15}{16}$ pounds in March, $1\frac{11}{16}$ pounds in April, $2\frac{1}{16}$ pounds in May, and just 2 pounds in June. How much did the baby gain in all during these months?

4. Mary, Grace, Jane, and Anna went picking berries. Mary picked $1\frac{3}{4}$ gallons, Grace picked 2 gallons, Jane picked $1\frac{1}{4}$ gallons, and Anna picked $2\frac{1}{4}$ gallons. How many gallons did the girls pick in all?

5. Mr. Avery sells milk. He sold $15\frac{3}{4}$ gallons on Monday, $16\frac{1}{4}$ gallons on Tuesday, 16 gallons on Wednesday, and $15\frac{1}{4}$ gallons on Thursday. How much milk did he sell in all?

Subtract the numbers in each of the following examples:

1	2	3	4	5
18135	111675	121315	1813	1089
8787	80888	91010	1008	200

6. How many miles are 8679 miles and 9584 miles?

7. If a family of 6 can live on $6.00 per day, how much money will be needed for 12 such families?

8. Mrs. Carter bought 6 pairs of stockings that were on sale for $4.50. How much was that per pair?

6. John has been learning to ride his new bicycle. He rode $2\frac{1}{3}$ miles on Monday, $3\frac{2}{3}$ miles Tuesday, 2 miles Wednesday, $3\frac{1}{3}$ miles Thursday, 3 miles Friday, and $6\frac{1}{3}$ miles Saturday. How many miles did he ride in all?

7. Susan bought some dress goods at the remnant sale. In one piece there were $2\frac{1}{2}$ yards, in another just 1 yard, in another $1\frac{1}{2}$ yards, and in another $3\frac{1}{2}$ yards. How many yards of goods did Susan buy in all?

1. Fred Hart earns \$2.78 per day. How much can Fred earn in 20 days?

2. Albert Page has 14 tops. If he gives 8 of them away, how many tops will he have left?

3. Mr. Mace bought 16 crates of strawberries. Each crate contained 24 quarts of berries. How many quarts of berries did Mr. Mace buy?

4. If lollipops are worth 30 cents a dozen, what will be the cost of 6 lollipops?

Easy Exercises in the Subtraction of Fractions

When fractions have the same denominator, we subtract their numerators and put the remainder over the denominator. Three fourths less one fourth equals two fourths, or $\frac{3}{4} - \frac{1}{4} = \frac{2}{4} = \frac{1}{2}$. One half less one half equals no halves, or $\frac{1}{2} - \frac{1}{2} = \frac{0}{2}$ or 0.

Subtract the following fractions without using pencil and paper:

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
(*A*)	$\frac{5}{8}$	$\frac{4}{5}$	$\frac{5}{6}$	$\frac{11}{16}$	$\frac{7}{12}$	$\frac{7}{8}$	$\frac{8}{9}$	$\frac{7}{16}$
	$\frac{3}{8}$	$\frac{3}{5}$	$\frac{1}{6}$	$\frac{5}{16}$	$\frac{5}{12}$	$\frac{1}{8}$	$\frac{2}{9}$	$\frac{3}{16}$
(*B*)	$\frac{2}{3}$	$\frac{8}{8}$	$\frac{7}{7}$	$\frac{16}{16}$	$\frac{5}{5}$	$\frac{3}{2}$	$\frac{5}{4}$	$\frac{11}{8}$
	$\frac{1}{3}$	$\frac{5}{8}$	$\frac{4}{7}$	$\frac{9}{16}$	$\frac{3}{5}$	$\frac{1}{2}$	$\frac{3}{4}$	$\frac{5}{8}$

Give the answers without using pencil and paper:

	(1)	(2)	(3)	(4)
(*A*)	$40 + 7 = ?$	$42 + 3 = ?$	$40 + 2 = ?$	$42 + 2 = ?$
(*B*)	$40 + 3 = ?$	$42 + 7 = ?$	$40 + 6 = ?$	$45 + 2 = ?$
(*C*)	$42 + 4 = ?$	$40 + 5 = ?$	$49 + 1 = ?$	$42 + 5 = ?$
(*D*)	$45 + 4 = ?$	$42 + 6 = ?$	$45 + 5 = ?$	$49 + 2 = ?$
(*E*)	$48 + 2 = ?$	$49 + 3 = ?$	$48 + 3 = ?$	$45 + 6 = ?$

Find the products:

1	2	3	4	5
5400	6410	8400	9810	$2.37
43	5	6	67	30

6. How many are 8600 pounds and 6712 pounds?

7. How many pecks and quarts are there in 781 quarts?

Easy Exercises in the Subtraction of Mixed Numbers

We often need to subtract numbers like these:

Examples

(*A*)	(*B*)	(*C*)
$15\frac{1}{4}$	$19\frac{3}{8}$	$20\frac{4}{5}$
10	$11\frac{1}{8}$	$12\frac{1}{5}$
$5\frac{1}{4}$	$8\frac{2}{8} = 8\frac{1}{4}$	$8\frac{3}{5}$

In the first case there is nothing to subtract from $\frac{1}{4}$, so we merely write it in the answer. Then we subtract the whole numbers. In the other two cases we subtract the fractions first and then subtract the whole numbers. We change the answer to its lowest terms whenever it is necessary to do so.

Find the remainders:

	(1)	(2)	(3)	(4)	(5)
(*A*)	$16\frac{1}{2}$	$23\frac{4}{5}$	$66\frac{2}{3}$	$25\frac{3}{4}$	$95\frac{15}{16}$
	10	$14\frac{3}{5}$	$16\frac{2}{3}$	$16\frac{1}{4}$	$29\frac{3}{16}$
(*B*)	$60\frac{5}{12}$	$45\frac{5}{6}$	$81\frac{7}{9}$	$14\frac{6}{7}$	$45\frac{5}{8}$
	$29\frac{1}{12}$	$29\frac{1}{6}$	$25\frac{3}{9}$	$9\frac{4}{7}$	$20\frac{3}{8}$

Easy Problems

1. Mr. Jones keeps a grocery store. On Monday morning he had $25\frac{1}{2}$ pounds of butter. Monday night he had only 15 pounds. How many pounds of butter did he sell during the day?

2. James Hanson had $8\frac{3}{4}$ gallons of milk. He sold $2\frac{1}{4}$ gallons to Mrs. Adams, 3 gallons to Mrs. Black, and planned to keep 4 gallons for himself. Did he have 4 gallons left for himself? How do you know?

3. William had \$5.00. He bought a cap for $1\frac{3}{4}$ dollars and a tie for $1\frac{1}{4}$ dollars. How much change should he receive?

4. Mary plans to have a party. She needs $2\frac{2}{3}$ dozen cookies. Her mother gave her $\frac{2}{3}$ of a dozen. How many more must she buy?

5. Tom's mother told him that he could play for one hour and three quarters. He has been playing for one hour and a quarter. How much longer has he to play?

6. Grace made an average of $91\frac{5}{6}$ in her studies last month. Helen's average was $90\frac{1}{6}$. How much higher is Grace's average than Helen's?

7. Jane found $1\frac{3}{4}$ dozen eggs today and Patrick found $\frac{3}{4}$ of a dozen. How many more eggs did Jane find than Patrick?

8. Anna rode her bicycle $2\frac{3}{4}$ miles. Susan rode $1\frac{1}{4}$ miles. How much farther did Anna ride than Susan?

---

1. Sixty cents is how many times 6 cents?

2. How much is 69×45?

3. Grace spent \$6.89 for Christmas presents. Martha spent \$3.56. Which girl spent more? How much more?

4. If I read $\frac{2}{3}$ of an hour each day for 6 days, how many hours do I read in all?

9. Arthur can run 100 yards in $12\frac{4}{5}$ seconds. It takes Raymond $12\frac{1}{5}$ seconds to run the same distance. How much less is his time than that of Arthur? Which boy runs faster?

10. Roscoe has dug $3\frac{5}{8}$ bushels of potatoes. Robert dug $2\frac{3}{8}$ bushels in the same time. Which boy dug more potatoes? How much more?

Changing Mixed Numbers to Improper Fractions

In adding fractions you had to change improper fractions to mixed numbers. Now you will need to change mixed numbers to improper fractions. Suppose you wish to change $3\frac{2}{7}$ to an improper fraction. There are $\frac{7}{7}$ in 1; so in 3 there will be $3 \times \frac{7}{7}$, or $\frac{21}{7}$. Then in $3\frac{2}{7}$ there will be $\frac{21}{7} + \frac{2}{7}$, or $\frac{23}{7}$. Therefore $3\frac{2}{7} = \frac{23}{7}$.

Change the following mixed numbers to improper fractions:

	(1)	(2)	(3)	(4)	(5)
(*A*)	$2\frac{3}{4}$	$3\frac{1}{5}$	$2\frac{4}{7}$	$6\frac{1}{4}$	$8\frac{1}{3}$
(*B*)	$3\frac{1}{3}$	$37\frac{1}{2}$	$66\frac{2}{3}$	$16\frac{2}{3}$	$87\frac{1}{2}$

1. Multiply 3490 by 380.

2. How many times is 9 cents contained in 63 cents?

3. Mr. Brown and Mr. Weller sell coffee. Last month Mr. Brown sold 798 pounds of coffee, and Mr. Weller sold 356 pounds. Which man sold more coffee? How much more did he sell?

4. How many 35-cent articles can you buy for $2.80?

5. How many 2-inch lengths of ribbon can be cut from a piece of ribbon 3 feet 10 inches long?

Change these mixed numbers to improper fractions. Do not use your pencil and paper.

	(1)	(2)	(3)	(4)	(5)
(*A*)	$1\frac{2}{7} = ?$	$1\frac{1}{3} = ?$	$1\frac{3}{5} = ?$	$1\frac{1}{8} = ?$	$1\frac{11}{16} = ?$
(*B*)	$1\frac{1}{4} = ?$	$1\frac{13}{16} = ?$	$1\frac{7}{12} = ?$	$1\frac{1}{6} = ?$	$1\frac{1}{12} = ?$
(*C*)	$1\frac{2}{5} = ?$	$1\frac{1}{7} = ?$	$1\frac{5}{12} = ?$	$1\frac{1}{5} = ?$	$1\frac{1}{16} = ?$
(*D*)	$1\frac{3}{7} = ?$	$1\frac{3}{16} = ?$	$1\frac{4}{7} = ?$	$1\frac{9}{16} = ?$	$1\frac{5}{9} = ?$
(*E*)	$1\frac{7}{16} = ?$	$1\frac{1}{9} = ?$	$1\frac{3}{8} = ?$	$1\frac{7}{9} = ?$	$1\frac{5}{16} = ?$
(*F*)	$1\frac{2}{9} = ?$	$1\frac{5}{7} = ?$	$1\frac{4}{9} = ?$	$1\frac{5}{8} = ?$	

Getting Ready for the Subtraction of Mixed Numbers

How can we subtract $\frac{2}{3}$ from 1? We cannot until we change the form of the 1. There are $\frac{3}{3}$ in 1, so we put $\frac{3}{3}$ in the place of 1 in the exercise. It will then read "How can we subtract $\frac{2}{3}$ from $\frac{3}{3}$?" Then we can say $\frac{2}{3}$ from $\frac{3}{3}$ leaves $\frac{1}{3}$.

Give the answers without using pencil and paper:

	(1)	(2)	(3)	(4)
(*A*)	$48 + 5 = ?$	$54 + 5 = ?$	$56 + 2 = ?$	$48 + 6 = ?$
(*B*)	$54 + 6 = ?$	$48 + 7 = ?$	$54 + 7 = ?$	$56 + 3 = ?$
(*C*)	$64 + 2 = ?$	$54 + 8 = ?$	$56 + 5 = ?$	$81 + 2 = ?$
(*D*)	$56 + 6 = ?$	$64 + 3 = ?$	$81 + 3 = ?$	$63 + 2 = ?$
(*E*)	$64 + 4 = ?$	$81 + 5 = ?$	$63 + 3 = ?$	$72 + 2 = ?$
(*F*)	$81 + 8 = ?$	$64 + 6 = ?$	$72 + 3 = ?$	$63 + 4 = ?$
(*G*)	$64 + 7 = ?$	$63 + 6 = ?$	$19 + 4 = ?$	$72 + 4 = ?$
(*H*)	$49 + 4 = ?$	$45 + 7 = ?$	$54 + 2 = ?$	$49 + 5 = ?$
(*I*)	$45 + 8 = ?$	$48 + 4 = ?$	$49 + 6 = ?$	$54 + 3 = ?$

In the following examples find the remainders. Do not use pencil and paper.

	(1)	(2)	(3)	(4)	(5)
(*A*)	$1 - \frac{3}{4}$	$1 - \frac{1}{16}$	$1 - \frac{1}{2}$	$1 - \frac{1}{9}$	$1 - \frac{15}{16}$
(*B*)	$1 - \frac{1}{3}$	$1 - \frac{11}{12}$	$1 - \frac{2}{3}$	$1 - \frac{13}{16}$	$1 - \frac{1}{4}$
(*C*)	$1 - \frac{7}{12}$	$1 - \frac{1}{5}$	$1 - \frac{5}{16}$	$1 - \frac{11}{16}$	$1 - \frac{3}{5}$
(*D*)	$1 - \frac{4}{9}$	$1 - \frac{3}{16}$	$1 - \frac{1}{7}$	$1 - \frac{2}{5}$	$1 - \frac{5}{12}$
(*E*)	$1 - \frac{6}{7}$	$1 - \frac{4}{5}$	$1 - \frac{1}{12}$	$1 - \frac{1}{6}$	$1 - \frac{4}{7}$

1. It is 1052 miles from Chicago to New Orleans on the Illinois Central. It is 508 miles from Chicago to Memphis. How far is it from Memphis to New Orleans?

2. If I travel 52,800 feet in 30 minutes, how many feet do I travel per minute?

3. City A has a population of 229,869. City B has a population of 108,754. Which city is larger? How much larger?

4. How much will 4 gallons and 3 quarts of cider bring at 18 cents per quart?

5. How many quarts more are there in $\frac{7}{8}$ of a bushel than in $\frac{3}{4}$ of a bushel?

	(1)	(2)	(3)	(4)	(5)
(*F*)	$1\frac{8}{9}$	$1\frac{5}{6}$	$1\frac{1}{8}$	$1\frac{2}{9}$	$1\frac{5}{7}$
(*G*)	$1\frac{7}{8}$	$1\frac{2}{7}$	$1\frac{5}{9}$	$1\frac{3}{8}$	$1\frac{9}{16}$
(*H*)	$1\frac{3}{7}$	$1\frac{5}{8}$	$1\frac{7}{16}$	$1\frac{7}{9}$	$1\frac{1}{13}$

Give the answers without using pencil and paper:

	(1)	(2)	(3)	(4)
(*A*)	$72 + 6 = ?$	$13 + 5 = ?$	$63 + 7 = ?$	$12 + 5 = ?$
(*B*)	$63 + 8 = ?$	$72 + 7 = ?$	$15 + 4 = ?$	$72 + 8 = ?$
(*C*)	$18 + 6 = ?$	$11 + 3 = ?$	$19 + 7 = ?$	$14 + 6 = ?$
(*D*)	$15 + 7 = ?$	$17 + 4 = ?$	$29 + 5 = ?$	$28 + 8 = ?$
(*E*)	$21 + 5 = ?$	$29 + 8 = ?$	$22 + 6 = ?$	$20 + 7 = ?$
(*F*)	$23 + 7 = ?$	$24 + 6 = ?$	$27 + 9 = ?$	$25 + 9 = ?$
(*G*)	$24 + 8 = ?$	$31 + 6 = ?$	$28 + 7 = ?$	$31 + 8 = ?$
(*H*)	$30 + 9 = ?$	$31 + 5 = ?$	$31 + 2 = ?$	$11 + 2 = ?$
(*I*)	$12 + 4 = ?$	$19 + 3 = ?$	$17 + 9 = ?$	$29 + 8 = ?$
(*J*)	$28 + 6 = ?$	$27 + 2 = ?$	$26 + 7 = ?$	$17 + 7 = ?$
(*K*)	$15 + 5 = ?$	$12 + 2 = ?$	$13 + 4 = ?$	$20 + 3 = ?$
(*L*)	$21 + 7 = ?$	$29 + 6 = ?$	$25 + 8 = ?$	$19 + 2 = ?$

1. Mrs. Jones has 811 chickens. Mrs. White has 769. Which woman has more chickens? How many more?

2. Mr. Carter bought 7 yards of muslin at 35 cents a yard, two pairs of shoes at $4.75 a pair, 10 pounds of sugar at 8 cents per pound, and a blanket for $4.75. What was the total amount of his bill?

More Difficult Exercises in the Subtraction of Mixed Numbers

Here are two examples in subtraction which are quite different, though they look alike. Can you tell the difference between them?

Examples

(*A*) $45\frac{1}{4}$ − 16 = $29\frac{1}{4}$

(*B*) 45 − $16\frac{1}{4}$ = $28\frac{3}{4}$

In example (*A*) you have $\frac{1}{4}$ with nothing to take from it. $\frac{1}{4}$ less nothing is $\frac{1}{4}$; so you put $\frac{1}{4}$ in the answer. Then you subtract the whole numbers. In example (*B*) you have $\frac{1}{4}$, but there is nothing above to subtract it from. The upper number needs something which you must give to it. In your past work you have learned that you can give, or add, something to the upper number when it needs it. But if you give something to the upper number, you must give the **same amount** to the lower one. The upper number 45 needs something. So give it 1. The 1 you call $\frac{4}{4}$, because you have $\frac{1}{4}$ to subtract from it. You must also give 1 to the lower number. When you have given 1, or $\frac{4}{4}$, to the upper number, you can subtract the $\frac{1}{4}$ in the lower

---

Find the quotients:

1. $6934 \div 72 = ?$
2. $7580 \div 25 = ?$
3. $8492 \div 43 = ?$
4. $2947 \div 68 = ?$
5. $9378 \div 49 = ?$
6. $7263 \div 37 = ?$

7. How many dolls at 99 cents each must a clerk in a store sell in order to take in $59.40?

number from it. This is how you get the $\frac{3}{4}$ in the answer. Then you remember that you gave 1 to the lower number so as to be fair to it. After you have given 1 to the lower number it becomes $17\frac{1}{4}$. You have already subtracted the $\frac{1}{4}$; so you must now subtract the 17 from the 45. This gives the 28 in the answer.

Give the answers without using pencil and paper:

	(1)	(2)	(3)	(4)
(*A*)	$14 + 4 = ?$	$17 + 2 = ?$	$13 + 2 = ?$	$29 + 7 = ?$
(*B*)	$26 + 6 = ?$	$22 + 5 = ?$	$25 + 6 = ?$	$14 + 3 = ?$
(*C*)	$15 + 2 = ?$	$29 + 3 = ?$	$28 + 7 = ?$	$29 + 2 = ?$
(*D*)	$23 + 6 = ?$	$26 + 4 = ?$	$23 + 5 = ?$	$26 + 5 = ?$
(*E*)	$21 + 2 = ?$	$20 + 4 = ?$	$22 + 4 = ?$	$26 + 3 = ?$
(*F*)	$35 + 5 = ?$	$13 + 5 = ?$	$23 + 7 = ?$	$33 + 6 = ?$
(*G*)	$26 + 8 = ?$	$32 + 4 = ?$	$16 + 5 = ?$	$34 + 7 = ?$

1. Find the difference between 8653 and 3150.

2. How many rows will there be if 108 trees are planted 9 in a row?

3. How many weeks are there in 896 days?

4. Subtract 102410 from 859810.

5. How many pounds are there in 124 ounces of rice?

6. A village had 1013 people living in it. Six hundred and four of them moved away because the mines closed. How many people were left in the village?

7. How long does it take to travel 722 miles at 38 miles per hour?

8. How many gallons are there in 60 quarts?

9. Find the quotient: $724464 \div 97$.

10. Divide 7586 by 89.

Now look at the following examples:

Examples

(*A*) $41\frac{2}{3}$ $13\frac{1}{3}$ $28\frac{1}{3}$

(*B*) $41\frac{1}{3}$ $13\frac{2}{3}$ $27\frac{2}{3}$

What is the difference between them? In the first one you have $\frac{1}{3}$ to take from $\frac{2}{3}$. This leaves $\frac{1}{3}$, as shown in the answer. In the second one you have $\frac{2}{3}$ to take from $\frac{1}{3}$. You cannot do this because $\frac{2}{3}$ is more than $\frac{1}{3}$. The top number needs something again. So let us give 1 to both the top number and the bottom number. The $\frac{1}{3}$ in the top number will then become $1\frac{1}{3}$, or $\frac{4}{3}$. Two thirds from $\frac{4}{3}$ leaves $\frac{2}{3}$, as shown in the answer. Then since you have given 1 to the lower number also, it becomes $14\frac{2}{3}$. Fourteen from 41 leaves 27.

Can you tell when the upper number needs 1? Let us see if you can. Examples (*A*) and (*B*) on page 105 have "Yes"

Find the sums:

1	2	3	4
2400			
7950			5540
8389	3210	9930	6701
5257	5514	2713	7671
3574	2823	3223	1394
4426	5214	4722	8860
1233	8146	3082	448
1225	867	855	607
3124	9097	66	209
421	971	59	108

written after them because their upper numbers need 1. You will have to give them 1 before you can get the answers. Examples (*C*) and (*D*) have "No" written after them because their upper numbers do *not* need to have 1 given to them.

Examples

(*A*) $6\frac{3}{8}$ Yes
$\underline{4\frac{4}{8}}$

(*B*) $5\frac{1}{3}$ Yes
$\underline{4\frac{2}{3}}$

(*C*) $10\frac{4}{5}$ No
$\underline{7\frac{3}{5}}$

(*D*) $8\frac{1}{6}$ No
$\underline{5}$

Now write numbers and letters on your tablet corresponding to those of the examples on page 106. Under each number, at the right of the proper letter, write the word which tells whether or not you will have to give 1 to the upper and lower numbers. Do not work the examples.

1. Grace Harris saves $29.76 per month. How much does she save in 9 months?

2. Frank Connor had $130.84 when he came to the city. After doing his trading he had $79.98 left. How much did Frank spend?

3. A dealer paid $35.64 for 18 ukuleles. How much did he pay for each ukulele?

4. One city has a population of 1,858,259. Another city has 534,136 inhabitants. Find the difference in the population of the two cities.

5. Fresh eggs are sometimes packed 12 in a box. How many eggs will there be in 98 such boxes?

6. How many dollars are $670 and $378?

	(1)	(2)	(3)	(4)	(5)
(*A*)	$125\frac{3}{5}$	$121\frac{11}{16}$	10	$10\frac{1}{2}$	$18\frac{5}{12}$
	100	$103\frac{15}{16}$	$5\frac{1}{2}$	5	$10\frac{7}{12}$
(*B*)	$16\frac{3}{4}$	$256\frac{7}{8}$	$30\frac{1}{4}$	100	$87\frac{1}{2}$
	$9\frac{1}{4}$	$125\frac{5}{8}$	$9\frac{3}{4}$	$33\frac{1}{3}$	50
(*C*)	$114\frac{1}{7}$	$65\frac{7}{9}$	$225\frac{1}{6}$	100	50
	$56\frac{4}{7}$	$26\frac{4}{9}$	$25\frac{5}{6}$	$66\frac{2}{3}$	$37\frac{1}{2}$
(*D*)	$44\frac{4}{9}$	100	100	$40\frac{1}{3}$	100
	$11\frac{1}{9}$	$12\frac{1}{2}$	$18\frac{3}{4}$	28	$41\frac{2}{3}$

Add these numbers:

1	2	3	4	5
				2321
				5630
1970	3130		4152	7314
9447	8795	3468	5460	2210
4258	4549	7690	9337	7194
3435	3656	3455	6968	1742
2344	2233	7439	2109	3227
5465	5147	4056	2862	1101
5637	3725	5935	6308	5169
7313	7545	3606	494	147

6. I had \$106 and spent \$40. How much money have I now?

7. What is $\frac{1}{2}$ of 72 inches?

8. If one ball costs 78¢, how many balls can you buy for \$79.56?

9. How many pints are there in 190 quarts?

Ask your teacher to tell you if your No's and Yes's were all right. Try to remember the following facts:

> You must never give 1 to upper numbers that do not need it.
>
> You must always give 1 to upper numbers that do need it.
>
> If you give 1 to the upper number, you must always give it to the lower number also.

Now work out the examples in Rows (*A*), (*B*), (*C*), and (*D*) on page 106 and see if you can get all the answers right.

Problems in the Subtraction of Mixed Numbers

1. William Smith sells milk. Yesterday he started out with 16 gallons of milk in his wagon. When he returned he had $2\frac{1}{2}$ gallons left. How many gallons did he sell?

2. John Capper has 5 dollars. His friend, Fred Nichols, wants to borrow $3\frac{1}{2}$ dollars. How much money will John have left if he lends $3\frac{1}{2}$ dollars to Fred?

1. If one waiter can serve 8 guests, how many guests can 43 waiters serve?

2. Mr. Smith has 1317 acres of land. Mr. King has 838 acres. Which man has more? How much more?

3. A merchant paid \$3.98 each for toy wagons. How many such wagons could he buy for \$115.42?

4. $16209 - 9452 = ?$

5. The blocks in our city are 300 feet square. What is the area of one of these blocks?

3. Our baby now weighs $15\frac{3}{16}$ pounds. Last month he weighed only $13\frac{5}{16}$ pounds. How much weight did he gain during the month?

4. James can run 100 yards in $12\frac{1}{5}$ seconds. Tom runs the same distance in $11\frac{4}{5}$ seconds. Which boy runs the faster? How much less time does it take him to run 100 yards?

5. Children start going to school in our village at the age of 6. Mary Robbins is just $4\frac{5}{12}$ years old. How long will it be before Mary will be old enough to go to school?

Find the remainders:

1	2	3	4	5
1314	7984	66664	8105	82947
985	6731	28490	6469	18395

6. Mr. Brock has 275 bushels of potatoes. He has sold 178 bushels. How many bushels of potatoes did he have at first?

7. There is a debt of $568.70 on our church. Forty-seven of the members agreed to pay this debt off. How much must each member pay if all pay equal amounts?

8. At 45 miles per hour how far will a train go in 52 hours?

9. Mr. Ames sells his dressed chickens at $1.05 each. He bought a bill of goods which amounted to $31.50. How many chickens must Mr. Ames sell to pay for the goods which he has bought?

10. One field is 47 rods long and 32 rods wide. Another field is 46 rods long and 23 rods wide. Which field is larger? How much larger?

6. The girls in our grade need 5 yards of ribbon for badges. They received $2\frac{2}{3}$ yards as a gift and can buy the remainder to match. How many yards must they buy?

7. Willis and Alta have promised to carry 10 gallons of water for their mother. They have already carried $7\frac{7}{8}$ gallons. How many more gallons must they carry?

8. James and his sister Grace help to take care of the baby. They keep a record of the time which each one spends with the baby during each week. Last week James spent $8\frac{7}{12}$ hours with the baby and Grace spent $9\frac{5}{12}$ hours with her. Which one spent more time with the baby. How much more?

Find the products:

1	2	3	4
9760	2679	190	82346
651	840	72	967

5. There are 1214 students in Central College. Five hundred and fifty-six of them are planning to leave the city during Easter vacation. How many students are expecting to remain at the college?

6. \$3.06 is how many times 18 cents?

7. Subtract 6916 from 12913.

8. Mr. Carter's orchard contains 1400 trees in 56 rows. How many trees are there in each row?

9. $9830 \times 96 = ?$

10. At 70 miles per hour how long will it take an airplane to fly 2660 miles?

9. The floor of our schoolroom contains 600 square feet. The area of the window glass is $96\frac{9}{16}$ square feet. It should be 120 square feet. How much does it lack of having the area that it should have?

10. John Markham lives in the country and sells eggs in town. Last week he started to town with 12 dozen eggs. The road was rough and John drove quite fast. When he got to town $1\frac{3}{4}$ dozen of the eggs were broken. How many did he have left to sell?

11. Helen and Jane have been averaging their grades for last month. Helen's average was $90\frac{1}{6}$. Jane's was $88\frac{5}{6}$. Which girl had the higher average? How much higher?

12. A year ago today gasoline was selling at $16\frac{3}{4}$ cents a gallon. Today it sells at $20\frac{1}{4}$ cents. How much more per gallon do we pay now than we paid last year?

Give the answers without using pencil and paper:

	(1)	(2)	(3)	(4)
(*A*)	$25 + 6 = ?$	$26 + 7 = ?$	$27 + 9 = ?$	$27 + 6 = ?$
(*B*)	$27 + 8 = ?$	$28 + 6 = ?$	$26 + 8 = ?$	$24 + 9 = ?$
(*C*)	$40 + 4 = ?$	$42 + 5 = ?$	$45 + 5 = ?$	$48 + 2 = ?$
(*D*)	$42 + 6 = ?$	$40 + 5 = ?$	$48 + 4 = ?$	$45 + 6 = ?$
(*E*)	$40 + 6 = ?$	$42 + 7 = ?$	$45 + 7 = ?$	$48 + 6 = ?$
(*F*)	$45 + 8 = ?$	$40 + 7 = ?$	$72 + 3 = ?$	$42 + 2 = ?$
(*G*)	$45 + 2 = ?$	$42 + 4 = ?$	$45 + 4 = ?$	$63 + 3 = ?$
(*H*)	$72 + 4 = ?$	$49 + 1 = ?$	$63 + 4 = ?$	$72 + 6 = ?$

13. There are 50 pupils in our school. Our playground contains $721\frac{3}{4}$ square feet. How many square feet must be added to it to give 15 square feet of area to each pupil?

14. Apples cost 5 cents each if bought one at a time. If bought by the dozen, they cost $4\frac{1}{6}$ cents each. How much is saved on each apple by buying them by the dozen?

Practice Exercises

Give the answers without using pencil and paper:

	(1)	(2)	(3)	(4)
(*A*)	$49 + 2 = ?$	$63 + 6 = ?$	$72 + 7 = ?$	$49 + 4 = ?$
(*B*)	$67 + 7 = ?$	$72 + 8 = ?$	$49 + 5 = ?$	$63 + 8 = ?$
(*C*)	$49 + 6 = ?$	$81 + 2 = ?$	$64 + 2 = ?$	$81 + 3 = ?$
(*D*)	$64 + 3 = ?$	$54 + 3 = ?$	$81 + 4 = ?$	$64 + 4 = ?$
(*E*)	$54 + 5 = ?$	$64 + 6 = ?$	$54 + 6 = ?$	$81 + 5 = ?$
(*F*)	$64 + 7 = ?$	$81 + 8 = ?$	$63 + 2 = ?$	$54 + 7 = ?$
(*G*)	$54 + 8 = ?$	$72 + 2 = ?$	$48 + 7 = ?$	$36 + 8 = ?$

1. What part of 20 is 5?

2. Mr. Black is hauling his wheat to market. He has hauled 5 loads that weighed as follows:

Load 1	2739 lb.
Load 2	2900 lb.
Load 3	3084 lb.
Load 4	2876 lb.
Load 5	3200 lb.

How many pounds of wheat has Mr. Black hauled in all?

3. Multiply 13685 by 345.

4. How many miles and feet are there in 10789 feet?

5. Divide 671672 by 852.

6. Find the quotient: $2772 \div 6$.

7. Mrs. Cates raises flowers and sells them. She has sold 26 dozen roses at $3.27 per dozen. How much did her roses bring in all?

8. Mr. Chase bought a house and lot for $8976.70. He has paid $6542.02. How much does he still owe?

9. If I want to save $126.27 for a sideboard in 9 weeks, how much must I save per week?

10. Mr. Case has $1218.16. If he spends $979.00 for a car, how much will he have left?

11. If one ton of hard coal costs $18.75, how much will 78 tons cost?

12. Find the total amount of this bill:

100 lb. pig meal	$3.89
1 set automobile chains	4.45
10 rd. poultry fence	5.98
1 flash light	1.49
1 lawn mower	11.98

13. Our dining-table is 12 feet long when all the leaves are in. The table is $4\frac{1}{2}$ feet wide. What is the area of the top of the table when it is fully extended?

14. Mr. Ingraham runs a clothing store. He bought $357.16 worth of sweaters in one order. He paid $94.09. How much does he still owe?

15. Mr. Stewart has 538 acres in one farm, 468 acres in another, and 226 acres in another. How many acres has Mr. Stewart in all?

16. What is $\frac{3}{4}$ of 48 quarts?

17. What is the cost of 35 quarts of milk at $6\frac{1}{2}¢$ a quart?

18. At 45 miles per hour, how far can I travel in 57 hours?

19. Find the product of 98 and 78.

20. Mr. Barber wishes to buy an automobile that costs $3347.00. He has only $2122.11. How much more money does he need?

21. A farmer harvested $2\frac{1}{4}$ tons of wheat. How many bags, each of which can hold 150 pounds, will he need to hold all his wheat?

22. Find the difference between 1816 and 1098.

23. A club of 98 members paid $122.50 for a banquet. If they shared the cost equally, how much did each member pay?

24. Change 1179 pints to quarts and pints.

25. Mr. Swift has 9974 bushels of wheat. He estimates that he lost 7600 bushels in a flood. How many bushels would he have if the flood had not come?

26. If I earn $8.97 in one week, how much can I earn in a year?

27. Mary Clark saved $19.88 in four weeks. What was her average saving per week?

28. What part of 1 foot 8 inches is 4 inches?

Find the sums:

29	30	31	32	33
3950		4640		
6395	5364	2243	4701	2661
5535	3886	4879	8840	5295
8766	5055	4427	1919	9910
2447	2842	9032	9043	1229
6313	6316	8175	1788	1588
2007	8015	3702	66	3536
3254	3622	2097	453	7202
121	178	700	9089	6175

Using Mixed Numbers in Multiplication

Example (*A*). Multiply 16 by $12\frac{1}{2}$.

$$\begin{array}{r} 16 \\ 12\frac{1}{2} \\ \hline 8 \\ 32 \\ 16 \\ \hline 200 \end{array} \qquad \frac{1}{2} \times \overset{8}{\not 16} = 8$$

Multiply by the fraction first. $\frac{1}{2} \times 16 = 8$. Put the 8 under the units' column. Then multiply the whole numbers as you have always multiplied them. Add your results. Notice that the 2 of 32 is just below the 8.

Example (*B*). Multiply $24\frac{3}{4}$ by 75.

$$\begin{array}{r} 24\frac{3}{4} \\ 75 \\ \hline 56\frac{1}{4} \\ 120 \\ 168 \\ \hline 1856\frac{1}{4} \end{array} \qquad 75 \times \tfrac{3}{4} = \tfrac{225}{4} = 56\tfrac{1}{4}.$$

Give the answers without using pencil and paper:

	(1)	(2)	(3)	(4)
(*A*)	$42 + 6 = ?$	$48 + 3 = ?$	$45 + 2 = ?$	$42 + 5 = ?$
(*B*)	$45 + 4 = ?$	$42 + 2 = ?$	$48 + 4 = ?$	$45 + 5 = ?$
(*C*)	$42 + 3 = ?$	$45 + 6 = ?$	$49 + 1 = ?$	$42 + 4 = ?$
(*D*)	$45 + 7 = ?$	$48 + 5 = ?$	$42 + 5 = ?$	$45 + 8 = ?$
(*E*)	$49 + 2 = ?$	$45 + 8 = ?$	$49 + 3 = ?$	$56 + 2 = ?$
(*F*)	$63 + 5 = ?$	$49 + 4 = ?$	$56 + 3 = ?$	$63 + 6 = ?$
(*G*)	$49 + 5 = ?$	$56 + 4 = ?$	$63 + 8 = ?$	$49 + 6 = ?$

Example (*A*) does not look just like Example (*B*), but they are worked very much alike.

See if you can get the right answers to the following exercises. Do not fail to multiply by the fractions. Be sure to put the ones' figure of the first product under the ones' figure of the number to be multiplied.

Find the products:

	(1)	(2)	(3)	(4)	(5)
(*A*)	1728	640	$87\frac{1}{2}$	$66\frac{2}{3}$	$125\frac{1}{2}$
	$16\frac{3}{4}$	$33\frac{1}{3}$	12	20	8
(*B*)	25	80	75	144	32
	$3\frac{3}{4}$	$16\frac{2}{3}$	$18\frac{3}{8}$	$16\frac{3}{4}$	$5\frac{7}{16}$

1. Grace Carson works 7 hours per day. How many hours does Grace work in 4 days?

2. A tennis racket costs $8.35. Charles Cary has $4.98. How much more money does Charles need in order to buy a tennis racket?

3. Mr. Alcorn spent the following amounts on his farm last year:

Repairs on buildings	$197.00
New machinery	445.00
Hired help	279.00
One team of horses	380.00

How much did Mr. Alcorn spend in all?

4. I had 109 chickens. I sold 11 of them. How many chickens did I have left?

5. Divide 354363 by 67.

Problems about Buying Goods

If there is a fraction of a cent in your answer, omit the fraction and add one more cent to the whole number.

Find the cost of each of the following purchases:

1. $3\frac{3}{4}$ yd. of imitation flannel at \$1.48 per yard.
2. $2\frac{3}{4}$ lb. of bacon at 48¢ a pound.
3. $16\frac{1}{2}$ yd. of lace at 8¢ a yard.
4. 10 lb. of navy beans at $8\frac{1}{2}$¢ a pound.
5. 12 pigs' feet at $8\frac{1}{3}$¢ each.
6. $2\frac{2}{3}$ dozen eggs at 50¢ a dozen.

Give the answers without using pencil and paper:

	(1)	(2)	(3)	(4)
(*A*)	$56 + 5 = ?$	$64 + 2 = ?$	$54 + 6 = ?$	$56 + 7 = ?$
(*B*)	$64 + 3 = ?$	$54 + 2 = ?$	$63 + 4 = ?$	$72 + 2 = ?$
(*C*)	$54 + 4 = ?$	$64 + 6 = ?$	$81 + 2 = ?$	$54 + 5 = ?$
(*D*)	$72 + 3 = ?$	$54 + 6 = ?$	$72 + 4 = ?$	$81 + 3 = ?$
(*E*)	$2 + 9 = ?$	$72 + 6 = ?$	$81 + 4 = ?$	$72 + 7 = ?$
(*F*)	$81 + 5 = ?$	$13 + 4 = ?$	$72 + 8 = ?$	$81 + 6 = ?$
(*G*)	$18 + 5 = ?$	$27 + 8 = ?$	$32 + 6 = ?$	$14 + 5 = ?$

1. Mrs. Roberts has 400 hens. She gathered 276 eggs each day for 14 days. How many eggs did Mrs. Roberts gather in all?

2. Mr. Rolfe had 10 tons of coal at the beginning of the winter. On March 1 he had only $1\frac{3}{4}$ tons left. How many tons of coal had Mr. Rolfe burned?

3. $33\frac{1}{3} - 14\frac{2}{3} = ?$

7. $2\frac{3}{4}$ lb. of corned beef at 22¢ a pound.

8. $3\frac{1}{4}$ yd. of voile at $4.50 per yard.

9. $2\frac{3}{4}$ lb. of frankfurters at 16¢ a pound.

10. $2\frac{5}{8}$ gal. of vinegar at 90¢ a gallon.

Problems about Rods, Yards, and Feet

Copy these facts in your tablet or notebook for reference. Memorize them as soon as you can.

1 rod (rd.) = $16\frac{1}{2}$ feet (ft.)
1 rod (rd.) = $5\frac{1}{2}$ yards (yd.)
1 square rod (sq. rd.) = $30\frac{1}{4}$ square yards (sq. yd.)

1. There are 320 rods in one mile. How many feet are there in one mile?

2. An acre contains 160 square rods. How many square yards are there in an acre?

3. Sometimes fence posts are set 8 feet apart. How many posts are needed to inclose a field 20 rods square?

Give the answers without using pencil and paper:

	(1)	(2)	(3)	(4)
(*A*)	$19 + 7 = ?$	$35 + 4 = ?$	$27 + 9 = ?$	$19 + 9 = ?$
(*B*)	$14 + 9 = ?$	$28 + 3 = ?$	$7 + 6 = ?$	$15 + 9 = ?$
(*C*)	$21 + 2 = ?$	$21 + 8 = ?$	$28 + 8 = ?$	$29 + 3 = ?$
(*D*)	$17 + 2 = ?$	$23 + 9 = ?$	$17 + 7 = ?$	$24 + 3 = ?$
(*E*)	$29 + 4 = ?$	$13 + 2 = ?$	$18 + 3 = ?$	$25 + 7 = ?$
(*F*)	$29 + 7 = ?$	$18 + 4 = ?$	$25 + 9 = ?$	$30 + 6 = ?$

4. Mr. Nelson is setting out 100 cherry trees. If a square rod of land is needed for each tree, how many square feet of land will Mr. Nelson need for all his trees?

5. The distance around a field, lot, or figure is called the **perimeter.** The perimeter of Mr. Ames's field is 3960 feet. If Mr. Ames sets his posts 1 rod apart, will 220 posts be enough for his fence? Prove your answer.

Find the remainders:

	(1)	(2)	(3)	(4)	(5)
(*A*)	1113	1816	127922	1314	164321
	466	1098	90057	1007	83400
(*B*)	2741	1916	120422	15003	173254
	1992	1007	50630	5570	96496

1. Find the sum of these numbers:

4300, 7589, 4366, 8644, 3476, 1543, 3949, and 6132.

2. What is the price of a single flash-light battery when 70 batteries cost $12.60?

3. Mrs. Conrad has saved $719.74 in seven years. She is thinking of taking a trip that will cost $183.98. How much of her savings will she have left if she takes this trip?

4. At a school picnic it cost 9 cents per person for refreshments. Two hundred and thirty-four persons were present. How much did the refreshments cost in all?

5. How many feet are there in 89 yards?

6. How many miles are there in 153120 feet?

7. How long will $925.25 pay expenses of $6.45 per week?

8. $3226 \div 342 = ?$

9. Divide 756 by 42.

6. Mr. Jones has 10 rods of poultry wire to fence in his poultry yard. Will that be enough to go around a square poultry yard with a perimeter of 52 yards? Prove your answer.

7. We are looking for a place to build our new schoolhouse. The schoolhouse and lawn will occupy 1000 square yards. We can get a field 8 rods square. Will this field be large enough to give 16 square feet of playground to each of 500 children after the 1000 square yards for the building and lawn have been deducted? Prove your answer.

Find the products:

1	2	3	4	5
6978	950	56	713	789
689	610	76	870	589

6. 27184 is how many times 98?

7. How many rows will 6408 trees make if they are set 89 to a row?

8. How many pounds are there in 34928 ounces?

9. A number of people in a small village wish to have a special train to take them to the city for an entertainment. The train will cost $106.25. How much must each person pay if 125 people go?

10. How many are 250 eggs and 187 eggs?

11. Eighty cents is how many times 10 cents?

12. A walk leading from the road to Mr. Rolfe's house is 9 feet wide and 57 feet long. How many square feet are there in the walk?

13. How many 5-inch lengths of wire are there in $2\frac{1}{2}$ yards of wire?

Practice Exercises

Find the differences:

1. $6855 - 3720 = ?$
2. $1315 - 787 = ?$
3. $1375 - 431 = ?$
4. $10964 - 3271 = ?$

5. How many gallons are there in 2116 quarts?

6. How long will it take to drive 1824 miles at 24 miles per hour?

7. Multiply 634201 by 405.

8. $234568 \times 2386 = ?$

9. Robert Markham was on the train going to visit his grandmother. He noticed that it took the train just one minute to go through a tunnel. He asked the conductor how fast the train ran through the tunnel. The conductor said "About 29 miles per hour." Robert then took pencil and paper out of his pocket and figured how many feet it was through the tunnel. How many was it?

10. Mr. Jones runs a dry-goods store. He has just bought 6 boxes of gloves for $207.00. There were 36 pairs of gloves in all six boxes. How much did the gloves cost per pair?

11. If I can walk 4 miles per hour, how far can I walk in 8 hours of walking time?

12. When Mrs. Price came to town, she had $113.21 in her purse. She now has $30.99. How much money has Mrs. Price spent?

13. How many times is $1.75 contained in $112.00?

14. How many weeks are there in 17927 days?

15. $14640 are how many dollars more than $7999?

16. How many bushels of wheat at $1.25 per bushel can you buy for $486.25?

More Problems about Buying and Selling

If there is a fraction of a cent in your answer, omit the fraction and add one cent to the whole number.

1. Mary worked $10\frac{3}{4}$ hours at 50 cents an hour. How much money should she receive?

2. Mr. Smith has been hauling his wheat to market. He hauls 25 sacks at a time. He had 10 loads and 15 sacks over. If the loads averaged 3750 pounds each, how many pounds of wheat did he have in all?

3. Mary bought 9 yards of trimming at $2\frac{2}{3}$ cents a yard. How much must she pay?

4. Tom Jones hauls ashes at $1.50 a load. He cleaned our ash bin yesterday. He had to haul $2\frac{2}{3}$ loads of ashes. How much should we pay him?

Find the remainders:

1	2	3	4	5
65632	10123	3981	12322	1443
28895	8889	1159	6654	679

6. An electric shop ordered batteries as follows:

287 batteries at 15¢ each
260 batteries at 17¢ each

How many batteries did the electric shop order? What was the total cost of the batteries?

7. Twenty-seven inches is what part of a yard?

8. A real-estate company must have $27,184 at once. How many lots must they sell at $1728 each to obtain the amount of money that they need?

Find the total cost of each of the following items:

5. $3\frac{3}{4}$ yd. of silk at \$1.98 per yard.
6. $9\frac{2}{3}$ yd. of serge at 90¢ a yard.
7. $7\frac{3}{4}$ yd. of satin at \$1.40 per yard.
8. $12\frac{3}{8}$ yd. of ribbon at 64¢ a yard.
9. $2\frac{3}{4}$ dozen eggs at 56¢ a dozen.
10. $12\frac{4}{9}$ yd. of oilcloth at 45¢ a yard.
11. $3\frac{3}{4}$ yd. of messaline at \$1.60 a yard.
12. $7\frac{2}{3}$ yd. of madras at 48¢ a yard.
13. $13\frac{5}{9}$ yd. of linoleum at \$1.89 a yard.
14. $16\frac{3}{4}$ yd. of lace at 8¢ a yard.
15. $17\frac{3}{4}$ yd. of gingham at 18¢ a yard.
16. $2\frac{3}{4}$ lb. of frankfurters at 15¢ a pound.
17. $7\frac{5}{8}$ yd. of embroidery at 20¢ a yard.
18. $5\frac{3}{4}$ gal. of cider at 50¢ a gallon.

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1. How many feet are there in $\frac{3}{4}$ mile?
2. What part of a bushel is 20 quarts?
3. How much will 6 pounds of mushrooms cost at 79 cents a pound?
4. Fred Condon saved \$89.20 in 35 weeks. What was Fred's average saving per week?
5. If a student spends \$8.45 per week, how long will \$92.95 last him?
6. $10 - 6\frac{1}{3} = ?$
7. What is the difference between $11\frac{3}{5}$ seconds and $13\frac{1}{5}$ seconds?

19. $3\frac{3}{4}$ yd. of denim at 30¢ a yard.

20. $12\frac{2}{3}$ yd. of calico at 12¢ a yard.

Miscellaneous Problems in Fractions and Mixed Numbers

Look at these problems:

Problem. Toy balloons are selling at 19 cents a dozen or 2 cents each. How much is saved on each balloon if you buy them by the dozen? D S

Problem. James bought 200 fishhooks at $12\frac{1}{2}$ cents a 100. He paid three dimes. How much change should he receive? D M S

The first problem has "D S" after it to show that to solve it you divide and then subtract. The second one has "D M S" after it to show that you divide, multiply, and then subtract to solve it.

Find the sums:

1	2	3	4	5
3467	4315	6561	1820	3233
4659	4856	8677	9477	6979
4573	7666	7964	4967	9465
8405	5693	3008	2335	3616
6549	1570	7573	3074	2043
1330	4837	4422	2209	3560
8625	3025	674	8755	7554
2390	47	9	4560	2428

6. If 98 bushels of potatoes cost $76.44, what is the price per bushel?

Read over the following list of problems and decide what has to be done to solve them. Write on your tablet the number of each problem. After each number write the letters which tell what must be done to solve the problem. Write first the letter which tells what to do first.

1. Mrs. Jones bought $2\frac{1}{2}$ dozen eggs at 60 cents a dozen and $1\frac{3}{4}$ pounds of butter at 52 cents a pound. How much did she pay in all?

2. Wash cloths are selling at 6 for 49 cents. How much less than 10 cents apiece is this?

3. If you buy $1\frac{3}{4}$ pounds of shelled pecans at $1.20 a pound and pay for them with a five-dollar bill, how much change should you get?

4. John began work at a quarter after nine in the morning and worked until a quarter of one. How many hours did he work?

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1. Henry Marks bought a bicycle for $47.75. He paid for it with a check for $98.94. How much change did Henry receive?

2. Sarah Perkins can make 59 pounds of candy in a week. At this rate how many pounds of candy can Sarah make in 9 weeks?

3. Thirty-seven children in the fifth grade gave $51.18 to help some poor people. What was the average amount given by each child?

4. Find the difference between 7379 and 2600.

5. What is the remainder when 7956 is subtracted from 10845?

5. Four of our boys are going to run in a short relay race with four boys from the Emerson School. Each pair of boys will run 110 yards. Our boys can run 110 yards in the following times:

Albert Arnold	$12\frac{2}{5}$ sec.
James Slode	$14\frac{1}{5}$ sec.
Tom Carter	$13\frac{2}{5}$ sec.
John Meyers	$12\frac{3}{5}$ sec.

The times for the boys from the Emerson School are as follows:

William Finley	$12\frac{4}{5}$ sec.
Arthur Collins	$14\frac{3}{5}$ sec.
Robert Allen	$13\frac{3}{5}$ sec.
Joe Capen	$13\frac{1}{5}$ sec.

If each of the eight boys can run as fast as this in the relay race, which team will win? By how much?

6. At 20 minutes of four Robert's mother said, "You may go out and play for three quarters of an hour." At what time was Robert to come in?

---

1. Mr. King bought 1196 pairs of shoes to sell this year. He had 375 pairs of shoes left from last year. How many pairs did Mr. King have to sell in all?

2. John Swift wants to buy an overcoat that costs $49.85. John has only $19.87. How much more money does John need to buy the coat?

3. Mary Grimes earns $1.27 in one day. At this rate how much can Mary earn in 90 days?

4. How many yards of silk at $1.85 per yard can you buy for $16.65?

7. Seven girls are planning to spend Saturday and Sunday at Look Over Lodge in the woods. The lodge is equipped with beds, dishes, and cooking utensils, but the girls will have to take their food and bed clothing with

them. They will have to walk part of the way because the car line is one mile from the lodge. They will need 75 pounds of bed clothing and 27 pounds of food. If each girl carries her share of the food and bed clothing, what will be her total load?

1. Find the total of this bill:

No. 2 cell batteries	$49.80
No. 1 cell batteries	112.25
Flash-light cases	857.80
Flash-light bulbs	2.04

2. Mrs. Brown sews for 75 cents per hour. How much can she earn in $6\frac{2}{3}$ hours?

3. A merchant bought 150 sweaters. Later he found that he had sold all but 60. How many had he sold?

8. Cinnamon is sometimes sold in 3-ounce packages. What part of a pound would 4 such packages be?

9. Three fourths of a pound equals how many ounces?

10. Arthur Bower picked $6\frac{1}{4}$ quarts of cherries. He sold $4\frac{3}{4}$ quarts and divided the remainder equally among 6 of his playmates. What part of a pint of cherries did each of his playmates receive?

11. Mildred Lee's mother bought $1\frac{1}{2}$ pounds of tea at 36 cents a pound. She gave the storekeeper three 25-cent pieces. How much change did she receive?

12. If it takes $4\frac{1}{3}$ yards of dress goods to make a dress for a woman and $2\frac{2}{3}$ yards for a child's dress, how many yards will be needed for 2 women's dresses and 4 children's dresses?

13. Mr. Smith has promised to sell 10 quarts of berries to his neighbor. He hired his children, John and Ida, to pick the berries. The children started picking, but they did not get along very well. John ate so many while he was picking that he had only $4\frac{3}{4}$ quarts left. Ida, who was quite little, became so tired after she had picked $2\frac{3}{4}$ quarts that she had to stop. How many more quarts must be picked if Mr. Smith is going to keep his promise?

Multiply these numbers:

1	2	3	4
6784	42356	989	756878
476	236	549	65

5. Nine feet are how many times 9 inches?

14. How much will 33 pints of milk cost at 12 cents a quart?

15. How many cubic inches are there in $1\frac{1}{4}$ cubic feet?

16. A truck loaded with coal weighs $4\frac{1}{4}$ tons. The truck when empty weighs $1\frac{3}{4}$ tons. How many tons of coal does the truck contain?

17. How much do $1\frac{3}{4}$ miles lack of being 10000 feet?

18. Six and three fourths years equal how many months?

19. John is 2 inches taller than Henry. Henry is 3 inches taller than George. John thought that he was 6 inches taller than George. Was he right? Prove your answer.

20. Arthur, Roland, and Dick are brothers. Last summer each of the boys planted 10 hills of watermelons. The plants in 2 of Arthur's hills died, and the moles ate the seed in 3 of Roland's hills. All the others grew. How many grew in all?

Did you make any mistakes in writing down the letters that tell what to do in each of the problems? If you did, ask your teacher to help you to get the letters right. After you are sure that all your letters are correct, work the problems. You will get the right answers if you do not make a mistake in addition, subtraction, multiplication, or division. Keep your list of letters to look at while you are working on the problems.

CHAPTER IV

DECIMAL FRACTIONS

You have learned what fractions are and how to solve problems and examples that contain them. You have worked with such fractions as $\frac{1}{2}$, $\frac{1}{3}$, $\frac{2}{3}$, $\frac{1}{4}$, $\frac{7}{4}$, $\frac{9}{8}$. You may have noticed that these fractions are a bit unhandy to write. You have to write two numbers for each fraction and sometimes the numbers which belong to the fraction get mixed up with the whole numbers and cause mistakes.

To avoid this someone thought of using only a few easy kinds of fractions instead of so many different kinds. The easiest kinds of fractions to handle are tenths, hundredths, and thousandths. This is the way these fractions look, as you have been writing fractions: $\frac{1}{10}$, $\frac{2}{10}$, $\frac{3}{10}$, $\frac{4}{10}$, and so on up to $\frac{9}{10}$. The hundredths are written: $\frac{1}{100}$, $\frac{2}{100}$, $\frac{25}{100}$, $\frac{49}{100}$, and so on. The thousandths are written $\frac{1}{1000}$, $\frac{2}{1000}$, $\frac{3}{1000}$, $\frac{25}{1000}$, $\frac{125}{1000}$, and so on. After a while someone found a way to write these fractions without having to write the denominators. This is the way it is done. Since all the denominators begin with 1, we do not need to write the 1, but we must remember it. A decimal point, or dot, is put before each numerator to show that all that comes after it is a fraction. The decimal point always has as many figures after it as there are zeros in the denominator.

Fractions of this sort are known as **decimal fractions** or **decimals.** Here are some of them: .1, .01, .001, .0001.

Every decimal fraction has a 1 at the left end of its denominator. It has as many figures, or places, after the decimal point as there are zeros in the denominator. Thus, .1 means the same as $\frac{1}{10}$; .01 means the same as $\frac{1}{100}$; .001 means the same as $\frac{1}{1000}$; and .0001 means the same as $\frac{1}{10000}$. In like manner .2 means $\frac{2}{10}$; .02 means $\frac{2}{100}$; .002 means $\frac{2}{1000}$; and so on. You had something much like this when you studied about dollars and cents. There are 100 cents in a dollar, and so one cent is $\frac{1}{100}$ of a dollar, or .01 of a dollar. Five cents is .05 of a dollar and 25 cents is .25 of a dollar.

Example. Write $\frac{75}{1000}$ as a decimal.

We know that 75 is the numerator; so we write 75. There are three zeros in the denominator, and so there must be three places, or figures, after the decimal point. But 75 has only two figures; so we must put a **zero in front of it.** Then we have .075. This is the same as $\frac{75}{1000}$. When we write $\frac{125}{1000}$ as a decimal fraction, we write .125. Since there are three figures in the numerator and three zeros in the denominator, we do not need any zeros after the decimal point.

Easy Practice in Writing Common Fractions as Decimal Fractions

Example (*A*). Look at these fractions: $\frac{1}{10}$, $\frac{7}{10}$.

To save time and to avoid mistakes we write them like this: .1 and .7. There is one figure on the right of the point. This tells us that there is one zero on the right of the 1 in the denominator.

Write the following common fractions in decimal form:

$\frac{3}{10}$, $\frac{9}{10}$, $\frac{8}{10}$, $\frac{4}{10}$, $\frac{2}{10}$, $\frac{5}{10}$, $\frac{6}{10}$.

Example (*B*). Look at this statement: $\frac{25}{100} = .25$.

We know that this is true because the decimal fraction must have as many places as there are zeros in the denominator. In like manner we know that $\frac{625}{1000} = .625$ and $\frac{4625}{10000} = .4625$.

Write these common fractions as decimals:

	(1)	(2)	(3)	(4)
(*A*)	$\frac{60}{100}$	$\frac{25}{1000}$	$\frac{75}{100}$	$\frac{125}{10000}$
(*B*)	$\frac{125}{1000}$	$\frac{40}{100}$	$\frac{1675}{10000}$	$\frac{12}{100}$
(*C*)	$\frac{45}{100}$	$\frac{875}{1000}$	$\frac{43}{100}$	$\frac{8775}{10000}$

Practice Exercises

Subtract the smaller number from the larger:

1	2	3	4	5
106101	69101	8900	7804	8398
26957	10245	5697	1010	3030

6. Mr. Walsh bought the following goods:

No. 2 cells	$191.24
No. 1 cells	30.56
Flash-light cases	537.29
Bulbs	1.56

What is the total of his expenditures?

7. Mrs. Hammond bought the following goods:

6 boxes washing powder	at $4\frac{1}{6}¢$ per box
10 bars soap	at $3\frac{1}{2}¢$ per bar
1 package bluing	$10¢$
2 wash basins	at $45¢$ each

How much did Mrs. Hammond spend in all?

Find the sums:

8	9	10	11
4280	5810	9840	8282
8339	8228	1933	2519
5932	9737	9966	8720
2495	5893	4043	1828
1587	7727	1113	8780
6204	51	8021	1078
4629	66	1285	4121
3301	63	259	618

12. What is the average cost of each article when 54 articles cost $89.66?

13. 10514 is how many times 72?

14. Change 31680 feet to miles.

15. How many 3-inch lengths of ribbon can be cut from 4 feet 9 inches of ribbon?

16. Jane Cook had $17.53 in the bank. She drew out $9.98. How much did she have left in the bank?

17. Last year Mr. Barnes made out four orders for cloth. His first order was for 250 yards, the second for 394 yards, the third for 168 yards, and the fourth for 384 yards. How many yards of cloth did Mr. Barnes order in all last year?

Give the answers without using pencil and paper:

	(1)	(2)	(3)	(4)
(*A*)	$45 + 2 = ?$	$49 + 3 = ?$	$42 + 2 = ?$	$45 + 3 = ?$
(*B*)	$49 + 2 = ?$	$45 + 5 = ?$	$45 + 8 = ?$	$54 + 2 = ?$
(*C*)	$42 + 4 = ?$	$48 + 4 = ?$	$54 + 6 = ?$	$48 + 5 = ?$
(*D*)	$54 + 7 = ?$	$48 + 6 = ?$	$56 + 3 = ?$	$54 + 8 = ?$
(*E*)	$48 + 7 = ?$	$56 + 6 = ?$	$64 + 2 = ?$	$81 + 2 = ?$

Example (*C*). Change $8\frac{75}{100}$ to decimal form.

We write the 8 just as it is because it is a whole number; then we write $\frac{75}{100}$ as .75. So $8\frac{75}{100}$ is the same as 8.75.

Change these mixed numbers to decimal form:

	(1)	(2)	(3)	(4)
(*A*)	$98\frac{2}{10}$	$68\frac{5}{10}$	$12\frac{5}{10}$	$1\frac{3}{10}$
(*B*)	$7\frac{8}{10}$	$6\frac{25}{100}$	$1\frac{25}{100}$	$9\frac{75}{100}$
(*C*)	$7\frac{50}{100}$	$1\frac{650}{1000}$	$1\frac{725}{1000}$	$11\frac{10}{100}$
(*D*)	$6\frac{725}{1000}$	$3\frac{1416}{10000}$	$10\frac{3775}{10000}$	$87\frac{5750}{10000}$

Example (*D*). Change .4825 to a common fraction.

We change .4825 by leaving out the decimal point and writing 10,000 as denominator. We write 10,000 because we must have as many zeros in the denominator as there are places to the right of the decimal point. We have now changed .4825 to $\frac{4825}{10000}$. This is the correct answer, but the answer is not in its lowest terms.

$$25 \left| \frac{4825}{10000} = \frac{193}{400}. \right.$$

That is, .4825 equals $\frac{193}{400}$.

Change the following decimal fractions to common fractions:

	(1)	(2)	(3)	(4)
(*A*)	.5	.743	.29	.95
(*B*)	.3825	.6	.1	.225
(*C*)	.07	.75	.2785	.9
(*D*)	.20	.850	.7	.9775

Example (*E*). Write 6.789 as a mixed number.

Six is a whole number and $.789 = \frac{789}{1000}$. We write $6\frac{789}{1000}$.

Write the following numbers as mixed numbers with common fractions:

	(1)	(2)	(3)	(4)
(*A*)	2.5	132.6	21.92	10.125
(*B*)	8.7875	207.85	1.675	7.5
(*C*)	22.725	93.4	8.35	48.50
(*D*)	16.2	2.65	101.8	64.275

Example (*F*). Change these common fractions to decimal fractions: $\frac{1}{100}$, $\frac{6}{1000}$, $\frac{75}{10000}$, $\frac{25}{1000}$.

You have already learned that in a decimal fraction the decimal point must have as many places after it as there are zeros in the denominator of the fraction. The first fraction, $\frac{1}{100}$, has two zeros in its denominator and only **one** figure in its numerator. The numerator must have another figure before we can write $\frac{1}{100}$ as a decimal fraction. In order to get another figure we write a zero **before** the 1 and then put in a decimal point; thus, .01.

---

1. Martha Davis can save 48 cents per week. In 4 weeks from now Martha wants to buy a fountain pen which costs $2.40. How much more money will she need than she can save in 4 weeks?

2. Mr. and Mrs. Olsen are going on a trip of 7930 miles. They have to get back home in 60 days. How many miles per day must they average?

3. How many weeks are there in 22742 days?

In like manner the second fraction, $\frac{6}{1000}$, must have three figures in its numerator when written as a decimal, because there are three zeros in its denominator. So we shall have to put two zeros in front of the 6. That is, $\frac{6}{1000}$ is the same as .006.

The third fraction, $\frac{75}{10000}$, has four zeros in its denominator. How many zeros must we write before 75?

How many zeros shall we need before the 25 when we change the fourth fraction, $\frac{25}{1000}$, to a decimal?

Write the following common fractions as decimal fractions. Be very careful as you write in the zeros.

	(1)	(2)	(3)	(4)	(5)
(*A*)	$\frac{2}{100}$	$\frac{2}{1000}$	$\frac{75}{1000}$	$\frac{3}{100}$	$\frac{25}{1000}$
(*B*)	$\frac{205}{10000}$	$\frac{75}{10000}$	$\frac{5}{100}$	$\frac{15}{1000}$	$\frac{9}{10000}$
(*C*)	$\frac{4}{100}$	$\frac{35}{1000}$	$\frac{6}{100}$	$\frac{5}{1000}$	$\frac{8}{100}$
(*D*)	$\frac{45}{1000}$	$\frac{10}{10000}$	$\frac{65}{1000}$	$\frac{7}{100}$	$\frac{75}{100}$

Write the following decimal fractions as common fractions. Do not forget that the number of figures to the

---

Give the answers without using pencil and paper:

	(1)	(2)	(3)	(4)
(*A*)	$56 + 7 = ?$	$64 + 3 = ?$	$81 + 4 = ?$	$64 + 4 = ?$
(*B*)	$81 + 3 = ?$	$63 + 2 = ?$	$64 + 7 = ?$	$81 + 5 = ?$
(*C*)	$63 + 3 = ?$	$81 + 6 = ?$	$72 + 2 = ?$	$63 + 4 = ?$
(*D*)	$72 + 3 = ?$	$63 + 7 = ?$	$5 + 6 = ?$	$72 + 8 = ?$
(*E*)	$63 + 8 = ?$	$72 + 4 = ?$	$8 + 9 = ?$	$3 + 6 = ?$
(*F*)	$72 + 7 = ?$	$9 + 9 = ?$	$8 + 2 = ?$	$1 + 1 = ?$
(*G*)	$54 + 7 = ?$	$48 + 6 = ?$	$56 + 3 = ?$	$54 + 8 = ?$

right of the decimal point, including the zeros, will tell you how many zeros to put in the denominator.

	(1)	(2)	(3)	(4)
(*A*)	.01	.015	.075	.09
(*B*)	.001	.02	.04	.07
(*C*)	.025	.004	.055	.065
(*D*)	.06	.045	.08	.0005
(*E*)	.035	.03	.085	.0356

More Difficult Exercises in Changing Common Fractions to Decimals

Example (*A*). Write $\frac{3}{4}$ as a decimal.

$$4\overline{)3.00}\quad .75$$

Notice that we put a decimal point and two zeros after the numerator 3. Then we divide by 4. We get .75 for a quotient. We put a decimal point in front of the 75, because there are two figures, or places, after the decimal

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1. If there are 36 apples in one peck, how many apples are there in 9 pecks?

2. I had \$75.24. I now have \$40.25. How much money have I spent?

3. How many articles at \$32.56 each must a merchant sell to receive \$7665.66?

4. Change 8944 ounces to pounds.

5. Mr. Burns sold $2\frac{2}{3}$ yards of ribbon from a spool containing 10 yards of ribbon. How many yards of ribbon are left on the spool?

6. $9\frac{1}{4}$ lb. $- 6\frac{3}{4}$ lb. $=$?

point in the dividend. Always put a decimal point in your answer just over the decimal point in the dividend. We change a common fraction to a decimal by writing a decimal point and zeros after the numerator. Then we divide by the denominator. In this example we write two zeros after the numerator. Two are enough, because with two the answer comes out even. Sometimes the answer will come out even when we have added only one zero. Sometimes we shall have to add more than one zero in order to have the answer come out even, and sometimes the answer will not come out even at all.

This is true when we change $\frac{2}{3}$ to a decimal. This is the way we do it: $3\overline{)2.00}^{.66\frac{2}{3}}$ We add two zeros as before, but the answer does not come out even. So we write the remainder 2 in the quotient and put the denominator 3 under it. The answer is read "$66\frac{2}{3}$ hundredths."

You will not be asked to add more than 4 zeros in the fifth grade. Use only enough zeros to make your answer come out even.

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1. $801 - 334 = ?$ 2. $642 - 198 = ?$ 3. $1346 - 468 = ?$

4. Mrs. Drace wishes to set 8 hens. How many eggs will she need if she gives 12 eggs to each hen?

5. Mr. Jackson wishes to set out 660 cabbage plants with 55 plants in a row. How many rows must he make?

6. How long would it take to travel 5850 miles if you could average 65 miles per hour?

7. John Kane weighs 50 pounds. His big brother weighs 120 pounds. Which boy is heavier? How much heavier?

Change these fractions to decimals. Do not add more than four zeros.

	(1)	(2)	(3)	(4)	(5)
(*A*)	$\frac{1}{2}$	$\frac{1}{9}$	$\frac{2}{3}$	$\frac{7}{12}$	$\frac{5}{7}$
(*B*)	$\frac{1}{3}$	$\frac{3}{4}$	$\frac{3}{16}$	$\frac{5}{16}$	$\frac{7}{9}$
(*C*)	$\frac{1}{4}$	$\frac{2}{5}$	$\frac{5}{12}$	$\frac{4}{5}$	$\frac{9}{16}$
(*D*)	$\frac{1}{5}$	$\frac{5}{6}$	$\frac{3}{5}$	$\frac{4}{7}$	$\frac{8}{9}$
(*E*)	$\frac{1}{6}$	$\frac{2}{7}$	$\frac{3}{7}$	$\frac{5}{9}$	$\frac{11}{16}$
(*F*)	$\frac{1}{7}$	$\frac{3}{8}$	$\frac{5}{8}$	$\frac{11}{12}$	$\frac{7}{8}$
(*G*)	$\frac{1}{8}$	$\frac{2}{9}$	$\frac{4}{9}$	$\frac{7}{16}$	$\frac{5}{10}$

Example (*B*). Change $\frac{1}{12}$ to a decimal.

$$\begin{array}{r} .0833\frac{1}{3} \\ 12\overline{)1.0000} \\ \underline{96} \\ 40 \\ \underline{36} \\ 40 \\ \underline{36} \\ 4 \end{array} \qquad \frac{4}{12} = \frac{1}{3}$$

This example is different from those that you just had. We write zeros after the numerator and divide as we did

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1. 67965 feet are how much more than 55498 feet?
2. What is the area of a lot that is 79 feet by 80 feet?
3. How many quarts are there in 15916 pints?
4. Find the quotient of $433956 \div 58$.
5. Find the product of 98765×798.
6. What part of a ton is 1500 pounds?

before. We put a decimal point in the quotient just above the decimal point in the dividend. Then we think 12's in 10, none, and write a zero in the quotient just after the decimal point. Then we think 12's in 100 are 8, and so on. We get a remainder of 4. This is $\frac{4}{12}$ and is equal to $\frac{1}{3}$; so the answer is $.0833\frac{1}{3}$.

Practice Exercises

Find the remainders:

1	2	3	4	5
1221	9679	7488	1297	1506
345	3000	2999	319	997

6. A group of young people wish to raise money to furnish a room in a hospital. The furniture will cost as follows:

1 bed	$28.54
1 mattress	12.78
1 chiffonier	35.55
1 wardrobe	42.50
1 screen	12.00
1 meal table	18.00
1 rocker	21.50
1 chair	12.00

How much money must they raise?

7. The total attendance for 20 days was 900. What was the average attendance per day?

8. Mary Archer saves $9.75 per month from her allowance. How much can she save in 9 months at that rate?

9. 675 is how many times 25?

10. John Carter weighs 96 pounds. Clinton, John's brother, weighs .96 pounds. Which boy weighs more? How much more?

Example (*C*). Change $\frac{1}{250}$ to a decimal.

$$250\overline{)1.000}\quad .004$$
$$1\,000$$

We think 250's in 10, none; put a zero in the quotient; 250's in 100, none; put another zero in the quotient; 250's in 1000 are 4.

Change each of the following common fractions to decimal form. Do not have more than four decimal places in your answer.

	(1)	(2)	(3)	(4)	(5)	(6)
(*A*)	$\frac{1}{16}$	$\frac{1}{20}$	$\frac{1}{25}$	$\frac{1}{30}$	$\frac{1}{40}$	$\frac{1}{50}$
(*B*)	$\frac{1}{75}$	$\frac{1}{125}$	$\frac{1}{80}$	$\frac{1}{90}$	$\frac{1}{300}$	$\frac{1}{70}$

Some of the answers that you got to the examples on the last few pages are used so frequently that it will pay to memorize them. They are given on page 141. Copy

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Find the sums:

1	2	3	4
5440	4971	8360	6100
6478	6279	3418	3097
2634	1418	8989	1191
7457	9142	6988	5002
5543	9031	7831	9196
4165	5147	3077	9909
3814	963	320	2957
2032	916	16	913

5. How many quarts of lemonade will be needed to serve 67 people if each person drinks one-half pint?

them in your tablet or work book, keep them for reference, and memorize them as soon as possible.

$\frac{1}{2} = .5$ or $.50$	$\frac{1}{4} = .25$
$\frac{3}{8} = .375$ or $.37\frac{1}{2}$	$\frac{5}{8} = .625$ or $.62\frac{1}{2}$
$\frac{7}{8} = .875$ or $.87\frac{1}{2}$	$\frac{1}{3} = .33\frac{1}{3}$
$\frac{1}{8} = .125$ or $.12\frac{1}{2}$	$\frac{1}{6} = .16\frac{2}{3}$
$\frac{2}{3} = .66\frac{2}{3}$	$\frac{1}{12} = .08\frac{1}{3}$
$\frac{1}{5} = .2$ or $.20$	$\frac{1}{7} = .14\frac{2}{7}$
$\frac{1}{9} = .11\frac{1}{9}$	$\frac{3}{4} = .75$

Changing Decimals to Common Fractions

Decimal fractions may be changed to common fractions by writing the denominators. We change the resulting fraction to its lowest terms, if this needs to be done; thus:

$.3 = \frac{3}{10}$	$.03 = \frac{3}{100}$	$.003 = \frac{3}{1000}$
$.4 = \frac{4}{10} = \frac{2}{5}$	$.04 = \frac{4}{100} = \frac{1}{25}$	$.004 = \frac{4}{1000} = \frac{1}{250}$

1. What part of a mile is 120 rods?

2. Frank Larson saved $4.86 in 27 weeks. How much did he save on the average per week?

3. May Mercer practices 5 hours a day. How many hours of practice can she do in 60 days at that rate?

4. Myrtle Moss bought 6 quarts of milk at 14 cents a quart. She gave the grocer a dollar bill. How much change should she receive?

5. How many dollars and cents are $514.43, $188.20, and $213.80?

Change each of the following decimal fractions to a common fraction:

	(1)	(2)	(3)	(4)
(*A*)	.5	.125	.60	.005
(*B*)	.25	.625	.175	.002
(*C*)	.225	.375	.325	.02
(*D*)	.20	.75	.875	.025
(*E*)	.15	.8	.95	.075

Addition of Decimals

Decimal fractions are added in the same way as whole numbers are, but we must watch one thing very carefully. The decimal points in each fraction must be in a straight line up and down. We write the example "Find the sum of .05, .125, .3, and .004" thus:

.05
.125
.3
.004

This does not seem correct because the right-hand edge is uneven. For this reason it is a good plan to put in zeros so that the edge will be even. Hence we change the column to this form:

.050
.125
.300
.004
.479

Then we add just as we add whole numbers, and get .479, which is the answer. Do not forget to put a decimal point in the sum. Put it just in line with the other decimal points.

Sometimes we find numbers like this: 3.625, 10.05, 125.5. Each is partly a whole number and partly a decimal. To add them we write them with the decimal points straight up and down, fill in the blanks on the right-hand side with zeros, and add as whole numbers, thus:

$$\begin{array}{r} 3.625 \\ 10.050 \\ \underline{125.500} \\ 139.175 \end{array}$$

Exercises in the Addition of Decimals

In order to show that you understand what you have just read, copy the numbers in each lettered row below and arrange them in columns. Put the decimal points one under another and fill in with zeros to make the right-hand edges even. When you have finished, ask your teacher to tell you if you have made any mistakes.

(*A*) .065, .2, .375, .225, .25
(*B*) 3.275, 16.25, 25.05, 62.5
(*C*) 1.005, 12., 80.1, .95
(*D*) .025, 69.45, 125.5, 100.
(*E*) .375, .225, .25, .15
(*F*) .025, .25, 2.5, 250.
(*G*) 119.75, 23.50, 75., 43.90
(*H*) .16, .24, .3, .25, .1
(*I*) 29.05, 1., .95, 8.75, 62.5
(*J*) 30.05, 29.7, 85., .025, .3

Did you get the numbers written right? When you are sure that they are all written correctly, find the sums. Do not forget to put a decimal point at the right place in the answer to each column.

Problems in the Addition of Decimals

1. When I started for the office, the speedometer on my car registered 22.8 miles. My office is exactly 3.7 miles from my home. What did the speedometer register when I reached my office?

2. A man wishes to build a fence around his garden. The garden is a triangle in shape, and so it has 3 sides. One side measures 50.5 feet, another side is 68.2 feet, and the third side is 79.3 feet. How many feet of fence will the man have to build?

3. The distance on the Michigan Central from Chicago to Kalamazoo is 141.5 miles; from Kalamazoo to Jackson, 67.9 miles; and from Jackson to Detroit, 74.1 miles. What is the total distance from Chicago to Detroit?

4. On a trial flight of 3 hours, an airplane made 112.4 miles in the first hour, 98.9 miles in the second hour, and 122.3 miles in the third hour. What distance did the airplane cover in the 3 hours?

---

1. How many pounds are there in $\frac{3}{4}$ ton?

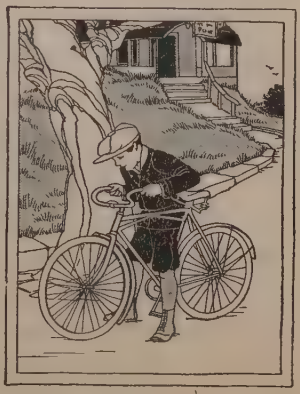
2. A group of 69 people promised to give $289.80 for foreign missions. How much must each person give, if they all give the same amount?

3. John Anderson wants to buy two large rubber balls that cost 29 cents each. John has only 50 cents. How many more cents does he need?

4. What is the difference between $13\frac{3}{4}$ feet and $16\frac{1}{4}$ feet?

5. $15 - 8\frac{1}{3} = ?$

5. Frank's father gave him a new bicycle on his birthday. It had a cyclometer to measure distance, as the speedometer does on an automobile. On the first day Frank rode 8.6 miles; on the second day, 7.9 miles; on the third day, 5.4 miles; on the fourth day, 3.3 miles. How far did he ride in the 4 days?



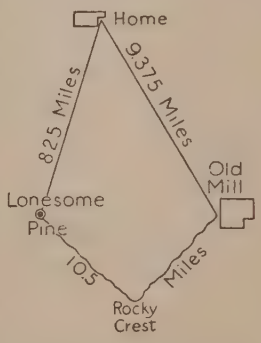
6. The distance from New York to Albany is 142.2 miles; from Albany to Syracuse, 147.4 miles; from Syracuse to Rochester, 80.3 miles; from Rochester to Buffalo, 68.5 miles. What is the entire distance from New York to Buffalo?

7. A railroad time-table gives the distance from New York City to Rome, New York, as 250.6 miles and from Rome, New York, to Niagara Falls as 209.8 miles. How far is it from New York City to Niagara Falls?

Add the following columns:

1	2	3	4	5
3410	2420	5650	8638	7771
2595	5329	8941	7669	3457
7426	6995	7086	5833	4761
1359	8246	2358	6177	6824
6462	2443	5624	3322	8078
7329	5304	2057	4144	3503
1491	1566	2709	1634	1037
9606	7586	4574	2371	3228

8. Mary and Helen rode their bicycles from their home to the Lonesome Pine, then over Rocky Crest and down to the old mill and back home over the short cut. Neither of the girls had a cyclometer on her wheel, but they found a map after they got home just like the one in the picture. From this map they figured out how far they had ridden. How far was it?



9. Mr. Smith has just bought a new automobile. His speedometer shows that the car has been driven 329.8 miles. Mr. Smith plans to drive as follows: from his home in Clinton, Iowa, to Sterling, Illinois; then to Freeport, Illinois; and from there to Chicago. The distance from Clinton to Sterling is 27.7 miles; the distance from Sterling to Freeport is 42.4 miles; and the distance from Freeport to Chicago is 113.5 miles. Mr. Smith plans to change the oil in his car after it has gone 500 miles. Will the speedometer register 500 miles before he gets to Chicago? Prove your answer.

---

1. Roberta Fisk had 152 lollipops. She gave some of them away, and then counted 94 lollipops that she had left. How many did she give away?

2. How many velocipedes worth $13.95 each can you buy with $502.20?

3. What will 100 pounds of sugar cost at 7 cents per pound?

Another Way of Adding Mixed Numbers

Sometimes it is necessary to add fractions and mixed numbers when the denominators of the fractions are not the same. An easy way to do this is to change each common fraction to a decimal and then add the decimals.

Example (*A*). Add $\frac{1}{2}$, $\frac{2}{3}$, and $\frac{3}{8}$.

$$\begin{aligned} \tfrac{1}{2} &= .500 \\ \tfrac{2}{3} &= .667 \\ \tfrac{3}{8} &= .375 \\ \hline & 1.542 \end{aligned}$$

Example (*B*). Add $2\frac{1}{7}$, $3\frac{1}{12}$, $9\frac{5}{16}$.

$$\begin{array}{lll} .143 & .083 & .313 \\ 7\overline{)1.000} & 12\overline{)1.000} & 16\overline{)5.000} \end{array}$$

$$\begin{aligned} 2\tfrac{1}{7} &= 2.143 \\ 3\tfrac{1}{12} &= 3.083 \\ 9\tfrac{5}{16} &= 9.313 \\ \hline & 14.539 \end{aligned}$$

In doing these examples we changed each common fraction to a decimal. We carried each decimal out to three places, using zeros when necessary. Some of the decimals did not come out even. In such cases we always drop the remainders, unless the next figure would be 5 or more. When the next figure would be 5 or more, we add 1 more to the last figure on the right. Thus in changing $\frac{2}{3}$ to a decimal we have to see that the next figure would be another 6. Six is more than 5, and so we write .667 instead of .666.

$$\begin{array}{r} .666 \\ 3\overline{)2.000} \\ \underline{18} \\ 20 \\ \underline{18} \\ 20 \\ \underline{18} \\ 2 \end{array}$$

Get the answers to the following examples and problems in the way you have just learned.

Find the sums:

1. $\frac{1}{4}$, $\frac{1}{5}$, $\frac{2}{7}$, and $\frac{1}{6}$.
2. $\frac{5}{6}$, $\frac{7}{8}$, $\frac{1}{9}$, and $\frac{3}{4}$.
3. $\frac{1}{2}$, $\frac{1}{4}$, $\frac{5}{7}$, and $\frac{3}{8}$.
4. $\frac{1}{12}$, $\frac{1}{16}$, $\frac{1}{20}$, and $\frac{1}{25}$.
5. $\frac{3}{5}$, $\frac{5}{8}$, $\frac{1}{3}$, and $\frac{1}{7}$.
6. $\frac{7}{9}$, $\frac{5}{12}$, $\frac{3}{7}$, and $\frac{4}{5}$.
7. $\frac{1}{24}$, $\frac{3}{16}$, $\frac{7}{12}$, and $\frac{1}{2}$.
8. $\frac{2}{5}$, $\frac{9}{16}$, $\frac{6}{7}$, and $\frac{1}{4}$.
9. $\frac{17}{24}$, $\frac{11}{12}$, $1\frac{3}{4}$, and $5\frac{1}{2}$.
10. $1\frac{2}{7}$, $5\frac{3}{8}$, $7\frac{1}{2}$, and $10\frac{3}{4}$.

Find the differences:

1	2	3	4	5
4341	1453	911	10123	7100
1667	1007	300	6578	1999

6. How many pints are there in 789 quarts?

7. How many toys at 68 cents each can be purchased for $138.04?

8. How many feet are there in 70 yards?

9. George Paine had 36 sticks of candy. Thirteen of them were red and the rest were white. How many were white?

10. Mr. Adams raises wheat. He has planted the same number of acres each year. The average yields per acre for the last five years on his farm have been as follows:

Four years ago, 21.6 bu. to the acre
Three years ago, 13.25 bu. to the acre
Two years ago, 16.7 bu. to the acre
Last year, 18.3 bu. to the acre
This year, 15.75 bu. to the acre

Find the average yield for the five years.

In solving these problems change the common fractions to decimals before you add.

1. Mrs. Jones bought remnants of ribbon as follows:

1 piece	$2\frac{2}{3}$ yd.
1 piece	$1\frac{7}{8}$ yd.
1 piece	$2\frac{1}{6}$ yd.
1 piece	$2\frac{3}{4}$ yd.

How many yards of ribbon did she buy in all?

2. We had 5 rains last month. The amount of rainfall for each rain was as follows: $\frac{5}{6}$ in., $2\frac{1}{4}$ in., $1\frac{1}{3}$ in., $\frac{7}{8}$ in., $2\frac{1}{5}$ in. What was the total rainfall for the month?

3. Mr. Arnold runs a grocery store and buys tomatoes to sell. Last week he bought $10\frac{3}{8}$ lb. on Monday, $15\frac{3}{16}$ lb. on Tuesday, $8\frac{1}{2}$ lb. on Wednesday, $12\frac{1}{4}$ lb. on Thursday, 8 lb. on Friday, and $6\frac{3}{4}$ lb. on Saturday. How many pounds did he buy during the whole week?

4. John, Carl, Mary, and Jane picked berries this morning. John picked $2\frac{3}{4}$ quarts, Carl picked $2\frac{1}{8}$ quarts, Mary picked $2\frac{1}{2}$ quarts, and Jane picked $1\frac{7}{8}$ quarts. How many quarts did they get in all?

---

1. Mr. Owens sold four cattle at $9\frac{1}{4}$ cents a pound. The cattle weighed 643 lb., 556 lb., 647 lb., and 595 lb. respectively. How much money did they bring?

2. What is $\frac{1}{9}$ of 7520 feet?

3. The enrollment in our room is 39 pupils. Today the number present was 32. How many pupils were absent?

4. How many 3-inch lengths are there in $2\frac{1}{2}$ feet?

5. What part of a mile is 2640 feet?

5. James does work for the neighbors and gets paid by the hour. He keeps a record of his work. This is his record for last week:

Day	Work	Time
Monday	Mowing lawns	$3\frac{5}{6}$ hr.
Tuesday	Errands	$2\frac{1}{4}$ hr.
Wednesday	Washing windows	$3\frac{1}{2}$ hr.
Thursday	Piling wood	$1\frac{4}{5}$ hr.
Friday	Beating rugs	$1\frac{3}{10}$ hr.
Saturday	Pulling weeds	$2\frac{1}{3}$ hr.

How many hours did he work during the whole week?

6. Mary keeps a record of the eggs which she gathers. This is a copy of her record from May 1 to June 5:

Week Beginning	Dozens of Eggs
May 1	$11\frac{3}{4}$
May 8	$12\frac{2}{3}$
May 15	$13\frac{1}{6}$
May 22	$10\frac{7}{12}$
May 29	$12\frac{5}{6}$

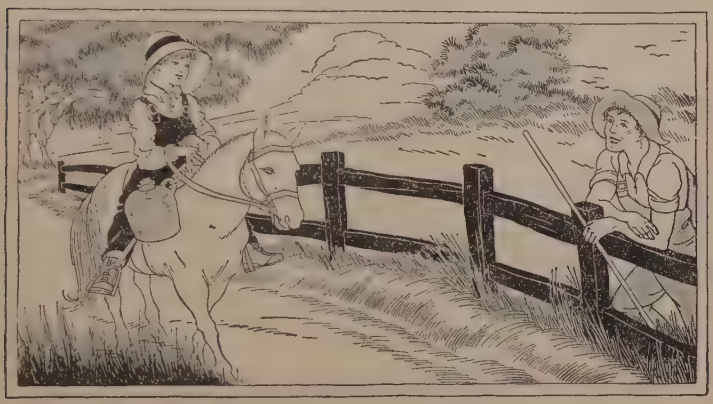
How many dozen eggs did she get in all?

7. Fred bought some pieces of wire of odd lengths as follows:

1 piece . . . . . $18\frac{3}{4}$ ft. long
1 piece . . . . . $15\frac{2}{3}$ ft. long
1 piece . . . . . $10\frac{1}{6}$ ft. long
1 piece . . . . . $20\frac{5}{12}$ ft. long

How many feet did he buy in all?

8. William rides his pony and carries water to the men who are working in the fields. It is $\frac{1}{3}$ of a mile from the well to the first field, $\frac{1}{4}$ of a mile from the first field to the



second field, $\frac{3}{16}$ of a mile from the second field to the third field, $\frac{1}{8}$ of a mile from the third field to the fourth field, and $\frac{1}{5}$ of a mile from the fourth field back to the well. How far does William ride while making a single round with the water jug?

Find the remainders:

1	2	3	4	5
923	7583	6233	6011	8671
456	1029	1999	3499	1994

6. How much can I save in 5 years if I save \$89.17 a year?

7. It costs Mr. Andrews \$2750 per year to maintain his home. What is the average cost of his home per day?

8. $121632 \div 52 = ?$

9. Helen makes butter and sells it. In July she sold butter as follows:

July 2	$2\frac{3}{4}$ lb.
July 9	$3\frac{5}{8}$ lb.
July 16	$3\frac{1}{16}$ lb.
July 23	$3\frac{1}{2}$ lb.
July 30	$2\frac{11}{16}$ lb.

How many pounds of butter did she sell during July?

10. Farmer Jones has $10\frac{2}{3}$ acres of oats, $21\frac{1}{2}$ acres of wheat, $15\frac{3}{5}$ acres of corn, and $19\frac{5}{8}$ acres of hay. The remaining $1\frac{3}{4}$ acres of his farm are taken up by his yard, barnyard, and orchard. How many acres are there in the whole farm?

Subtraction of Decimals

Decimal fractions are subtracted in the same way that whole numbers are, but you have to be very careful about the decimal points. The decimal point in the subtrahend must be directly under the decimal point in the minuend. Do not forget to put a decimal point in your answer. It should always go in just under the decimal point in the subtrahend.

1. Martin Varner paid \$1.25 for hickory nuts, 79 cents for walnuts, 25 cents for a basket, and 5 cents for chewing gum. Martin then had \$1.95 left. How much money did he have at first?

2. $56822 \div 94 = ?$

3. How many weeks are there in 1314 days?

4. What is the area of a piece of land that is 78 yards long and 100 yards wide?

Example. How much is $1.1 - .8$?

$$\begin{array}{r} 1.1 \\ .8 \\ \hline .3 \end{array}$$

We see that $11 - 8$ is 3, but there must be a decimal point in front of the 3 because there is a decimal point in the subtrahend and in the minuend.

Subtract these without using pencil and paper:

	(1)	(2)
(*A*)	.2 from .8	.5 from .7
(*B*)	.4 from .9	.6 from 1.4
(*C*)	.3 from .6	.9 from 1.7
(*D*)	.1 from .5	.8 from 1.5
(*E*)	.7 from .9	.6 from 1.5

Using your pencil, subtract these:

	(1)	(2)
(*A*)	1.7 from 7.9	197.6 from 313.7
(*B*)	4.9 from 8.2	211.2 from 282.2
(*C*)	111.8 from 132.5	240.6 from 316.4
(*D*)	178.4 from 251.3	173.5 from 200.3
(*E*)	251.3 from 318.1	220.2 from 237.6

Give the answers without using pencil and paper:

	(1)	(2)	(3)	(4)
(*A*)	$40 + 2 = ?$	$42 + 5 = ?$	$48 + 2 = ?$	$45 + 2 = ?$
(*B*)	$42 + 6 = ?$	$40 + 3 = ?$	$45 + 4 = ?$	$48 + 3 = ?$
(*C*)	$45 + 5 = ?$	$42 + 2 = ?$	$40 + 5 = ?$	$45 + 6 = ?$
(*D*)	$48 + 4 = ?$	$40 + 6 = ?$	$45 + 7 = ?$	$42 + 3 = ?$
(*E*)	$40 + 7 = ?$	$45 + 8 = ?$	$48 + 7 = ?$	$49 + 2 = ?$
(*F*)	$56 + 2 = ?$	$64 + 7 = ?$	$54 + 2 = ?$	$63 + 7 = ?$
(*G*)	$49 + 3 = ?$	$56 + 3 = ?$	$63 + 5 = ?$	$54 + 3 = ?$

More Difficult Exercises in the Subtraction of Decimals

Example. Subtract 2.5 from 6.

This example has a catch in it and a great many children get caught. When you first look at it 2.5 may seem larger than 6. But there is a decimal point in 2.5. This tells us that 2.5 is the same as $2\frac{5}{10}$. This you know is less than 6. Therefore we write the 2.5 under the 6. Remember that the decimal point in the subtrahend must be exactly under the decimal point in the minuend.

Did you notice on page 153 that there was one figure, or place, to the right of the decimal point in both minuend and subtrahend? The minuend and subtrahend must always have the same number of decimal places, if you are to avoid making mistakes in your subtraction.

Even though in simply writing a whole number without a decimal fraction, a decimal point is not generally used after it, as in the example "Subtract 2.5 from 6," yet a decimal point is always understood after a whole number. Since there is one decimal place in the subtrahend, 2.5, we must

Find the differences:

1	2	3	4	5
1354	978	7066	8344	7045
378	179	4068	4450	6656

6. How many pounds are there in 9984 ounces?
7. Find the product of 6789×89.
8. $1452 - 1063 = ?$

have one decimal place in the minuend also. We get this decimal place by writing in the decimal point and a 0 after 6 in the minuend. We then have 6.0, which is the same as 6. It is read "six and no tenths." Now we can subtract 2.5 from 6.0 as here shown.

$$\begin{array}{r} 6.0 \\ \underline{2.5} \\ 3.5 \end{array} \quad \textit{Ans.}$$

Make a column of numbers on your tablet just like the numbers of the examples in the following list. After the figure 1 write the number which is the smaller of the two numbers given in example 1. Do the same for each of the other examples.

1. 60.5,	25.	**7.** .875,	10.
2. 12.5,	1.	**8.** 80,	56.5.
3. .625,	1.	**9.** .50,	3.
4. $10,	$2.50.	**10.** 62.5,	100.
5. .02,	.1.	**11.** 50,	37.5.
6. 45,	22.4.	**12.** 18.75,	20.

Give the answers without using pencil and paper:

	(1)	(2)	(3)	(4)
(*A*)	$63 + 3 = ?$	$64 + 6 = ?$	$54 + 4 = ?$	$49 + 4 = ?$
(*B*)	$64 + 5 = ?$	$63 + 2 = ?$	$49 + 5 = ?$	$56 + 4 = ?$
(*C*)	$56 + 7 = ?$	$49 + 6 = ?$	$64 + 4 = ?$	$54 + 6 = ?$
(*D*)	$54 + 8 = ?$	$64 + 3 = ?$	$72 + 2 = ?$	$64 + 2 = ?$
(*E*)	$81 + 8 = ?$	$72 + 3 = ?$	$81 + 7 = ?$	$72 + 4 = ?$
(*F*)	$72 + 7 = ?$	$81 + 6 = ?$	$72 + 5 = ?$	$81 + 5 = ?$
(*G*)	$81 + 2 = ?$	$72 + 6 = ?$	$81 + 3 = ?$	$31 + 4 = ?$

13. 875,	7.899.	17. 17.5,	8.
14. 3,	2.5.	18. 7.5,	1.
15. .25,	7.	19. $.66\frac{2}{3}$,	2.
16. 5,	2.5.	20. $.12\frac{1}{2}$,	.3.

Ask your teacher to tell you of any mistakes which you made in writing down these numbers. Did you get caught on any of the examples? Correct all your mistakes; then find the difference between the two numbers in each of the examples. Be sure to put the smaller number underneath. Write the numbers so that the decimal point in the lower number will be just under the decimal point in the upper number. Fill in with zeros to make the right-hand edge even. Be sure to put a decimal point in your answer.

In each of the following examples the minuend needs more decimal places. It must always have just as many places as the subtrahend has. Give more places to each minuend before you subtract. Remember to put the decimal point in the subtrahend just under the one in the minuend. Do not forget to put a decimal point in your answer.

1. How much is 7×67 miles?

2. How long will it take to go 1828 miles at 38 miles per hour?

3. Subtract 893 from 1622.

4. Find the quotient when 66150 is divided by 98.

5. How long will \$71.25 last me if I spend \$2.85 per week?

Subtract the following numbers:

	(1)	(2)
(*A*)	2.5 from 40.	$3.60 from $75.
(*B*)	.6 from 154.	$1.85 from $40.
(*C*)	13.5 from 269.	.5 from 6.
(*D*)	$2.75 from $500.	.08 from 9.
(*E*)	$1.50 from $200.	.28 from 30.
(*F*)	2.37 from 428.	.15 from 53.7.
(*G*)	6.05 from 93.7.	.75 from 1.

Did you fail to get some of your answers right? If so, ask your teacher if you wrote your numbers down correctly.

1. The average yield of corn per acre in the United States is 29.3 bushels. Ten years ago it was 23.1 bushels. What has been the increase in the average yield?

2. Our production of wheat averages about 13.5 bushels per acre. Ten years ago the average production was 15.2 bushels per acre. What has been the decrease in the average production of wheat per acre?

Give the answers without using pencil and paper:

	(1)	(2)	(3)	(4)
(*A*)	$30 + 4 = ?$	$81 + 4 = ?$	$31 + 7 = ?$	$29 + 8 = ?$
(*B*)	$28 + 2 = ?$	$26 + 8 = ?$	$22 + 8 = ?$	$25 + 8 = ?$
(*C*)	$18 + 6 = ?$	$3 + 5 = ?$	$18 + 7 = ?$	$0 + 4 = ?$

1. We have 5607 strawberry plants to be planted 63 in a row. How many rows will there be?

2. How many gallons are there in 1193 quarts?

3. How much is $95 - 93\frac{3}{4}$?

3. You know how the doctor takes your temperature. If his thermometer registers 98.6 degrees, he says that your temperature is normal. That is, 98.6 degrees shows that the body is well. When Helen had the grippe, the doctor took her temperature in the morning and found that it was 103.4 degrees. How many degrees was this above the normal temperature?

4. The sum of the three sides of a triangle is 270.6 feet. The first side measures 90.4 feet; the second side measures 120.8 feet. What is the length of the third side?

5. Mr. Anderson bought 10 gallons of gasoline at 22 cents per gallon. He paid for it with a 10-dollar bill. How much change should he receive?

6. Mr. Jones has sold 6.25 yards of ribbon from a spool which contained 10 yards. How many yards of ribbon are left on the spool?

7. Mr. Carter has a 20-acre field to plow. He thinks he has already plowed 8.75 acres. How many acres are left to be plowed?

Find the sums:

1	2	3	4
	2610		9872
$35.66	6747	3420	8479
35.47	6488	6339	6413
8.75	4152	4429	1266
8.35	1346	9761	6635
43.67	7965	2284	1211
113.46	8529	4928	2763
3.20	1132	4197	3219

8. James Acklin, who lives in Louisville, Kentucky, planned to spend the summer at Mackinaw, Michigan, making the trip by automobile. The guidebook gave the distances along the road from Louisville as shown below:

	Miles from Louisville
Louisville	0.0
Columbus	83.2
Indianapolis	126.7
Logansport	208.8
South Bend	275.2
St. Joseph	310.6
Muskegon	409.6
Manistee	507.7
Traverse City	574.1
Petoskey	646.0
Mackinaw	685.6

a. How far is it from Columbus to Indianapolis?

b. What is the distance from Indianapolis to South Bend?

c. How far is St. Joseph from Muskegon?

d. How far is it from Muskegon to Traverse City?

e. What is the distance from Indianapolis to Petoskey?

---

1. Kate Curtis bought 48 cents' worth of frosted cakes. She paid with a check for $1.75. How much change should she receive?

2. How much will 24 cases of canned baked beans cost at 90 cents a case?

3. Mr. Thomas earned $179.56 per week on the average for a year. How much did he earn in all?

4. What part of a ton is 1750 pounds?

9. Mary Ogden bought two tablets at 7 cents each and a book for 65 cents. She paid with a 2-dollar bill. She expected to have $1.35 left to buy a berry spoon. Did she have as much as that left? Prove your answer.

Subtracting Fractions When the Denominators Are Not the Same

Sometimes we need to subtract fractions and mixed numbers in which the denominators are not the same. One way to do this is as shown in this problem.

Problem. Mrs. Jones had a piece of ribbon $2\frac{1}{3}$ yards long. She used $1\frac{1}{6}$ yards. How many yards had she left?

$\frac{1}{3} = .333$ $\quad$ $2\frac{1}{3} = 2.333$

$\frac{1}{6} = .167$ $\quad$ $1\frac{1}{6} = \underline{1.167}$

$\quad\quad\quad

remainder. Thus $\frac{1}{3}$ is called .333, because the figure in the fourth decimal place would be a 3; but $\frac{1}{6}$ is called .167, because the fourth figure would be a 6.

Practice Exercises

Find the differences:

1	2	3	4
911	1431	1277	1218
692	667	479	220

5. Mr. Hudson now has $72.00 in the bank. He has recently written checks as follows:

For groceries	$57.00
For taxes	292.00
For an automobile tire	29.00

How much did Mr. Hudson have in the bank before he wrote these checks?

6. It costs $187 to paint one medium-sized house. How much will it cost to paint 89 such houses?

7. How many feet are there in 3520 yards?

8. If 26 dozen oranges cost $24.44, what is the cost of 1 dozen oranges?

9. Grace Martin saved $454.48 last year. What were her average savings per week?

10. How many dollars are $995 and $585?

11. How many dozen eggs can you buy for $13.44 if eggs are selling at 56 cents a dozen?

12. One egg case contains 144 eggs. How many eggs will 670 egg cases contain?

13. How many inches are there in 5896 feet?

Problems in Which You Change Common Fractions to Decimals

Change the common fractions to decimal fractions before solving each of the following problems.

1. Mr. Adams sold $2\frac{1}{3}$ yards of ribbon to Mrs. Carter and $3\frac{1}{6}$ yards to Mrs. Jones. Both women bought ribbon from the same spool. If the spool had 10 yards on it at first, how many yards of ribbon are left on the spool?

Give the answers without using pencil and paper:

	(1)	(2)	(3)	(4)
(*A*)	$56 + 5 = ?$	$72 + 4 = ?$	$45 + 6 = ?$	$72 + 3 = ?$
(*B*)	$54 + 6 = ?$	$45 + 5 = ?$	$54 + 5 = ?$	$64 + 6 = ?$
(*C*)	$45 + 4 = ?$	$54 + 4 = ?$	$64 + 3 = ?$	$54 + 2 = ?$
(*D*)	$64 + 4 = ?$	$26 + 4 = ?$	$21 + 9 = ?$	$26 + 5 = ?$
(*E*)	$22 + 8 = ?$	$13 + 2 = ?$	$26 + 6 = ?$	$22 + 9 = ?$
(*F*)	$13 + 3 = ?$	$22 + 2 = ?$	$17 + 8 = ?$	$26 + 7 = ?$
(*G*)	$17 + 9 = ?$	$23 + 4 = ?$	$26 + 8 = ?$	$27 + 5 = ?$

1. These are the things we bought for our school picnic:

9 jars of raspberry jam at 29¢ each
6 dozen Parker House rolls at 20¢ per dozen
6 bottles of olives at 29¢ each
$2\frac{1}{4}$ lb. boiled ham at 75¢ per pound

Find the total cost.

2. The expense of our class picnic last year was $59.69. It was shared equally by 47 pupils. How much did each pupil pay?

3. Frank Baker wants to buy a bag to carry his books in. The bag costs 69 cents. Frank has only 37 cents. How much more money does he need?

2. Mr. Johnson had $21\frac{3}{4}$ pounds of butter Saturday morning. Late Saturday night he had only $3\frac{9}{16}$ pounds left. He had sold the rest during the day. How many pounds of butter did he sell that day?

3. Mary Warner promised her music teacher that she would practice $10\frac{1}{2}$ hours this week. She has already practiced for $6\frac{5}{6}$ hours. How many hours has she yet to practice to keep her promise?

4. John Golden is plowing his potato patch. The patch contains $\frac{2}{3}$ of an acre. John has plowed $\frac{1}{6}$ of an acre. What part of an acre is still unplowed?

5. William picked $5\frac{1}{4}$ bushels of apples. Carl picked $5\frac{3}{8}$ bushels. Which boy picked more? How much more?

6. Grace ran 100 yards in 14 seconds. Jane ran the same distance in $15\frac{2}{5}$ seconds. Which girl won? By how much?

7. Which is more, $\$\frac{1}{3}$ or $\$\frac{1}{6}$? How much more?

Find the remainders:

1	2	3	4	5
1107	833	1452	1309	112
340	394	994	430	89

6. How many 75-cent articles can you buy for $6.00?

7. How many square yards are there in a laundry room that is 6 yards wide and 7 yards long?

8. Our baby weighed $12\frac{1}{4}$ pounds in January and $14\frac{3}{16}$ pounds a month later. How much did the baby gain during the month?

9. There are two roads from Madison to Middleton. The first road is $8\frac{3}{4}$ miles long. The second road is $8\frac{2}{3}$ miles long. Which is the shorter road? How much shorter?

10. Which is more, $15\frac{3}{4}$ feet or 1 rod? How much more?

11. Ann, who is in the sixth grade, made an average of $91\frac{4}{7}$. Her sister Alice, who is in the fifth grade, had an average of $91\frac{5}{6}$. Which girl has the higher average? How much higher?

12. The same kind of braid sells at $1\frac{3}{4}$ cents a yard at the Boston Store and $1\frac{7}{12}$ cents at the New York Store. Which store sells the braid for less? How much less?

13. Cane sugar is $6\frac{3}{5}$ cents a pound. Beet sugar is $6\frac{1}{2}$ cents a pound. Which costs more? How much more?

14. Corks may be bought at the rate of $\frac{3}{7}$ cent each. Needles may be bought at the rate of $\frac{2}{5}$ cent each. Which costs more, a cork or a needle? How much more?

Give the answers without using pencil and paper:

	(1)	(2)	(3)	(4)
(*A*)	$22 + 4 = ?$	$27 + 9 = ?$	$28 + 2 = ?$	$18 + 8 = ?$
(*B*)	$23 + 2 = ?$	$28 + 5 = ?$	$19 + 3 = ?$	$24 + 7 = ?$
(*C*)	$28 + 8 = ?$	$19 + 5 = ?$	$25 + 7 = ?$	$29 + 5 = ?$
(*D*)	$19 + 6 = ?$	$25 + 8 = ?$	$29 + 6 = ?$	$19 + 8 = ?$
(*E*)	$25 + 9 = ?$	$31 + 3 = ?$	$32 + 7 = ?$	$33 + 6 = ?$
(*F*)	$31 + 6 = ?$	$34 + 5 = ?$	$31 + 8 = ?$	$29 + 1 = ?$

15. John and Allen study at home each night. Tonight John has studied $\frac{1}{2}$ hour and Allen has studied $\frac{3}{5}$ hour. Which boy has studied longer? How much longer?

Multiplication of Decimals

Decimals are multiplied in the same way that whole numbers are, but we have to be very careful to get the decimal point at the right place in the answer. We put as many decimal places in the product, or answer, as there are in both numbers that are multiplied taken together; thus:

$.2 \times 6 = 1.2$	$3 \times .5 = 1.5$	$.2 \times .6 = .12$
$5.2 \times 6 = 31.2$	$16 \times 10.5 = 168.0$	$1.5 \times .15 = .225$

Copy the numbers and letters of the examples below on your tablet. Look at the first example. It has one decimal place in the upper number and two in the lower; hence there will be three decimal places in the product. So put a 3 under the figure (1) to the right of (*A*) on your tablet to show that you know how many places to have in your answer. Do likewise for the other examples.

	(1)	(2)	(3)	(4)	(5)	(6)
(*A*)	40.5	30	20	.25	.16	2.6
	.25	.3	.9	8	9	7
(*B*)	2.5	4.2	.1	.2	75.50	9.06
	2.5	.25	.1	.3	.06	.52
(*C*)	12.50	.06	88.52	.025	.125	.3
	9	.06	.02	4	800	.3

Ask your teacher to check over the numbers which you have written on your tablet so that you may be sure that all of them are right.

Now multiply as in whole numbers. See if you can point off your answers correctly without help. Did you get them all pointed off correctly? Did you make any mistakes in multiplying?

In solving the following problems be sure to point off your answers correctly.

1. The Texas Special sometimes runs 51.75 miles per hour. At this rate how far will it go in 10.5 hours?

2. Mr. Smith had 40 acres of corn last year, which averaged 45.5 bushels to the acre. How much corn would he have raised if he had had 60 acres like that?

3. Our garden is just 46.8 feet square. We are planning to build a fence around it. The fence is to have two gates, one 8 feet wide and the other 3 feet wide. How many feet of fence shall we need? (Do not include the gates.)

4. Fencing of the kind that we want can be bought at \$0.14 per foot. How much will the whole fence without the gates cost?

---

1. How many 3-inch lengths can be cut from a stick 6 feet 6 inches long?

2. Thelma Jacobs had \$16.16. She spent \$9.10 for schoolbooks. How much money did Thelma have left?

3. $1222 - 898 = ?$

4. $9476 \div 92 = ?$

5. Find the product:

$$\begin{array}{r} 56789 \\ \times \quad 38 \\ \hline \end{array}$$

5. If we buy the large gate for \$16.50 and the small gate for \$4.75, what will be the total cost of the fence and both gates?

6. Mr. Adams has a water tank which is $\frac{2}{5}$ of a foot wide and 8.5 feet long. How many cubic feet of water are in the tank when the water is 6 inches deep?

7. If there are 2150.4 cubic inches in one bushel, how many cubic inches are there in 50 bushels?

8. There are 16.5 feet in one rod. How many feet are there in 320 rods?

> The sign $\times$ when used with dimensions means *by*.
> The sign $'$ means *feet*.
> Thus $6.75' \times 4.25'$ means 6.75 feet by 4.25 feet.

9. Which is larger, an area $6.75' \times 4.25'$ or one $8.375'$ by $3.5'$? How much larger?

10. *a*. How many minutes are there in 3.75 hours?
b. How many pounds are there in 8.0625 tons?
c. How many acres are there in 6.625 square miles?
d. How many quarts are there in 3.125 bushels?

11. *a*. How many yards are there in 15.5 rods?
b. How many inches are there in 8.4 feet?
c. How many quarts are there in 8.75 gallons?
d. How many ounces are there in 8.375 pounds?

12. Find the volume of a box 2.75 feet wide, 2 feet deep, and 5.75 feet long.

13. What part of \$1.25 is 75 cents?

Practice Exercises

Add these columns:

1	2	3
8894	9786	8870
8733	9496	3078
3417	9849	9837
1611	1110	1079
3076	1459	6104
3487	6750	7761
7053	2	301
415	443	443

4. How many pounds are there in $\frac{3}{4}$ ton of coal?

5. Mrs. Jacobs had 248 books in her library. She bought 87 new books and a friend gave her 57 more. How many books has Mrs. Jacobs now?

6. Ruth Clinton had 60 aster plants. She sold all but 7 of them. How many aster plants did Ruth sell?

7. A train traveled 2976 miles in 62 hours. What was its average rate per hour?

8. 9864 is how many times 89?

9. 1756 is how much more than 967?

10. A florist had 4368 carnation plants in his garden. There were 78 plants in each row. How many rows were there?

11. Multiply 346 by 789.

12. How many weeks are there in 2268 days?

13. One package of breakfast food contains 22 ounces. How many packages will it take to hold 1540 pounds of such breakfast food?

14. Find the product of 9876 and 68.

15. Divide 74962 by 56.

Some Important Decimals for Use in Multiplication

Copy the following facts on your tablet for future reference. Memorize them as soon as you can.

$16\frac{2}{3}$ cents $= \$0.16\frac{2}{3} = \$\frac{1}{6}$	$12\frac{1}{2}$ cents $= \$0.12\frac{1}{2} = \$\frac{1}{8}$
$33\frac{1}{3}$ cents $= \$0.33\frac{1}{3} = \$\frac{1}{3}$	10 cents $= \$0.10 = \$\frac{1}{10}$
25 cents $= \$0.25 = \$\frac{1}{4}$	$37\frac{1}{2}$ cents $= \$0.37\frac{1}{2} = \$\frac{3}{8}$
$14\frac{2}{7}$ cents $= \$0.14\frac{2}{7} = \$\frac{1}{7}$	$8\frac{1}{3}$ cents $= \$0.08\frac{1}{3} = \$\frac{1}{12}$
$66\frac{2}{3}$ cents $= \$0.66\frac{2}{3} = \$\frac{2}{3}$	$62\frac{1}{2}$ cents $= \$0.62\frac{1}{2} = \$\frac{5}{8}$
50 cents $= \$0.50 = \$\frac{1}{2}$	20 cents $= \$0.20 = \$\frac{1}{5}$
$11\frac{1}{9}$ cents $= \$0.11\frac{1}{9} = \$\frac{1}{9}$	$87\frac{1}{2}$ cents $= \$0.87\frac{1}{2} = \$\frac{7}{8}$

1. There are 1390 school children in the village. It has just been found that 492 of these children have poor eyesight. How many of the children have good eyes?

2. How many quarts are there in 2485 gallons?

3. How many pounds are there in 192 ounces?

4. How many gallons are there in 6504 quarts?

5. How many square feet are there in 12300 square yards?

6. $28798 \div 85 = ?$

7. $14 - 7\frac{1}{4} = ?$

8. $100\frac{1}{3} - 97\frac{2}{3} = ?$

9. How far does a train run in 9 hours if it averages 56 miles per hour?

10. The railroad charged \$163.20 for hauling 6400 pounds of freight. How much was that per hundred pounds?

11. Find the product of 838390 and 579.

12. Divide 81476 by 79.

Problem. How much will 4 dozen buttons cost at $16\frac{2}{3}$ cents a dozen?

Price = $16\frac{2}{3}¢$ a dozen. $16\frac{2}{3}¢ = \$\frac{1}{6}$.

$$\overset{2}{\cancel{4}} \times \$\frac{1}{\cancel{6}_{3}} = \$\frac{2}{3} = 66\frac{2}{3}¢. \qquad 67¢. \ \textit{Ans.}$$

Find the cost of each of the following purchases by the same method:

1. 6 lb. of Bordeaux mixture at $33\frac{1}{3}¢$ a pound.
2. 1 dozen hair brushes at 25¢ for each brush.
3. 5 yd. of cheesecloth at $14\frac{2}{7}¢$ a yard.
4. 6 lb. of bacon at $66\frac{2}{3}¢$ a pound.
5. 8 rolls of wall paper at 50¢ per roll.
6. 6 pairs of overalls at $87\frac{1}{2}¢$ a pair.
7. 4 yd. of calico at $12\frac{1}{2}¢$ a yard.
8. 4 yd. of cheesecloth at $11\frac{1}{9}¢$ a yard.
9. 8 yd. of oilcloth at $37\frac{1}{2}¢$ a yard.
10. 4 dozen safety pins at $8\frac{1}{3}¢$ a dozen.
11. 4 table covers at $62\frac{1}{2}¢$ each.
12. 6 bottles of perfume at $87\frac{1}{2}¢$ each.

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1. It takes 231 cubic inches of space to hold 1 gallon of water. How many cubic inches will it take to hold 2485 gallons of water?

2. Our janitor receives 75 cents per hour for extra work. How much will he receive for $7\frac{1}{2}$ hours of extra work?

3. How many quarts are there in 120 pecks?

4. 4896 is how many times 68?

5. What is the difference between 788 miles and 1633 miles?

Multiplying Decimals by 10, 100, and 1000

Problem. If fish lines are selling at .006 cent per foot, how much shall I have to pay for 10 feet? for 100 feet? At this rate what would 1000 feet of fish line cost?

$$10 \times .006¢ = .060¢ = .06¢$$
$$100 \times .006¢ = .600¢ = .6¢$$
$$1000 \times .006¢ = 6.000¢ = 6¢$$
$$10000 \times .006¢ = 60.000¢ = 60¢$$
$$100000 \times .006¢ = 600.000¢ = \$6.00$$

Notice how the decimal point is placed in each answer. When we multiply .006¢ by 10 we get .06¢. The decimal point has been moved one place to the right. There are two decimal places instead of three. When we multiply .006¢ by 100 the answer is .6¢. The decimal point has been moved two places to the right. In like manner when we multiply .006¢ by 1000 we move the decimal point three places to the right. Hence:

> To multiply a decimal by 10, 100, 1000, etc. move the decimal point to the right as many places as there are zeros in the multiplier.

1. How many miles are there in 7680 rods?
2. Subtract 99 from 298.
3. How long will $7.35 last me if I spend 35 cents a day?
4. How many days are there in 231 weeks?
5. How many ounces are there in 5 pounds?
6. How many square rods are there in 40 acres?

Write out the answers, using zeros if necessary:

	(1)	(2)
(*A*)	$100 \times 1.25 = ?$	$100 \times .025 = ?$
(*B*)	$10 \times .004 = ?$	$1000 \times .02 = ?$
(*C*)	$1000 \times .1 = ?$	$10 \times 28.25 = ?$
(*D*)	$10000 \times .0625 = ?$	$1000 \times 1.75 = ?$
(*E*)	$100 \times 87.5 = ?$	$100 \times .15 = ?$

Practice Exercises

Find the sums:

1	2	3	4
2130	2112	5430	3650
5446	2804	1575	9247
8675	9263	5844	7174
3547	5715	3569	6839
4402	6556	5756	2746
1834	3467	3044	2620
3475	6386	6705	3185
8489	3596	7574	3327

5. John Clark had $\frac{5}{8}$ pound of chocolates. Tom Walker had $\frac{1}{2}$ pound of chocolates. Which boy had more? How many ounces more?

6. How many yards are there in $\frac{3}{4}$ mile?

Find the remainders:

7	8	9	10	11
911	723	921	1367	831
302	267	255	599	287

12. How many dozen eggs at 45 cents per dozen will it take to pay for 30 pounds of sugar at 6 cents per pound?

13. What part of a square foot is an area 12 inches long and 8 inches wide?

14. Mrs. Chester made 289 cookies yesterday for Mr. Carter's restaurant. At that rate, how many cookies could Mrs. Chester make in 90 days?

15. Mrs. Arnold owed $15.00 for groceries. She paid the bill with a check for $21.00. How much change should Mrs. Arnold receive?

16. Louise Pearson's hens laid $6.30 worth of eggs in a day. At this rate what would be the value of the eggs laid by Louise's hens in 9 days?

17. Robert Franklin earned $42.84 in 51 weeks by running errands for the neighbors. How much did Robert average per week?

18. Find the cost of 48 pounds of salted pecans at $1.85 per pound.

19. Mrs. La Duke bought 25 pounds of corn meal for $3.00. How much was that per pound?

20. It was estimated that a certain city of 50,252 people spent $25,126 a day for food in 1914. What was the average expense per person?

Division of Decimals

Examples

(*A*) Find $\frac{1}{3}$ of 10.25.

$$3\overline{)10.25}\quad 3.41\tfrac{2}{3}$$

(*B*) $62.5 \div 5 = ?$

$$5\overline{)62.5}\quad 12.5$$

When there are decimal places in the dividend but none in the divisor, you divide as in whole numbers. Use long division if necessary. Put a decimal point in the quotient just over the decimal point in the dividend.

1. Find the total weight of the following:

5 sacks of cement	492 lb.
1 load of sand	2132 lb.
1 load of bricks	2775 lb.
2 loads of cinders	2233 lb.
5 small kegs of nails	436 lb.

2. Arthur Wilson wants to buy an Airedale pup that costs $12.00. Arthur has $6.00. How much more money does he need?

3. Mr. Smith sells typewriters. The following list shows the amounts of his sales for the first four months of last year:

January	$378.00
February	693.00
March	1430.00
April	826.00

Find the total of Mr. Smith's sales.

4. What is the difference between 1700 and 800?

5. How many ounces are there in 24 pounds?

Solve the following examples. Be sure to put a decimal point in each answer.

	(1)	(2)
(*A*)	$\frac{1}{3}$ of \$8.70 = ?	\$75.15 ÷ 15 = ?
(*B*)	$\frac{1}{4}$ of \$35.72 = ?	\$1.60 ÷ 5 = ?
(*C*)	$\frac{1}{2}$ of \$210.56 = ?	324.16 ÷ 16 = ?
(*D*)	$\frac{1}{8}$ of \$92.40 = ?	\$60.00 ÷ 75 = ?
(*E*)	$\frac{1}{6}$ of \$75.00 = ?	90.168 ÷ 13 = ?
(*F*)	$\frac{1}{4}$ of \$10.00 = ?	6.25 ÷ 25 = ?
(*G*)	$\frac{1}{7}$ of \$20.00 = ?	127.6 ÷ 6 = ?
(*H*)	$\frac{1}{8}$ of \$100.00 = ?	4694.4 ÷ 144 = ?
(*I*)	$\frac{1}{3}$ of \$1.00 = ?	6169.60 ÷ 640 = ?
(*J*)	$\frac{1}{4}$ of \$30.00 = ?	1443.75 ÷ 231 = ?

The word per is often used to mean of each, for each, in each.

1. James, Arthur, and Frank are going on a camping trip. Their supplies cost \$48.75. How much is this for each boy if they all share equally?

Give the answers without using pencil and paper:

	(1)	(2)	(3)	(4)
(*A*)	45 + 2 = ?	48 + 6 = ?	54 + 8 = ?	63 + 8 = ?
(*B*)	42 + 6 = ?	48 + 5 = ?	63 + 7 = ?	54 + 7 = ?
(*C*)	63 + 3 = ?	54 + 6 = ?	48 + 4 = ?	42 + 2 = ?
(*D*)	54 + 5 = ?	48 + 2 = ?	63 + 5 = ?	54 + 4 = ?
(*E*)	63 + 3 = ?	54 + 3 = ?	45 + 8 = ?	63 + 2 = ?
(*F*)	49 + 6 = ?	56 + 7 = ?	49 + 5 = ?	56 + 6 = ?
(*G*)	45 + 7 = ?	49 + 4 = ?	56 + 4 = ?	49 + 3 = ?

2. Harry, Elizabeth, and Kate bought a bracelet for their mother on her birthday. The bracelet cost $18.75. How much should each child pay if they are all going to pay the same amount?

3. A train travels from Chicago to Detroit in 7 hours. The distance is 283.5 miles. What is the average speed per hour?

4. The total weight of 11 men on a football team is 1922.5 pounds. What is the average weight per man?

5. A real estate firm sold 8 lots in a new part of the city for a total sum of $10,825. What was the average price per lot?

6. A 50-foot lot in this addition sold for $1275. What price per foot did this lot bring?

7. John's height is 55.2 inches, James's is 53.7 inches, and Henry's is 49.4 inches. What is their average height?

8. Albert Fleming drove his car from Chattanooga, Tennessee, to Atlanta, Georgia, a distance of 139.4 miles. His average speed was 25 miles per hour. How long did it take him to make the trip?

9. Mr. Fleming then drove from Atlanta to Macon, Georgia, in 3 hours. The distance is 94.5 miles. What was his average speed per hour?

---

1. Multiply 9876 by 29.

2. $41756 \div 84 = ?$

3. Mary is 10 years old today. Her sister Ruth is just $7\frac{1}{4}$ years old. Which girl is older? How much older?

4. $20\frac{1}{8} - 15\frac{7}{8} = ?$

10. A freight train was loaded at the mines with 2995 tons of coal. There were 48 coal cars on the train. What was the average weight of coal per car?

11. An airplane carrying the mail from Chicago to New York City made 112.95 miles in the first hour of the journey, 96.79 miles in the second hour, and 101.62 miles in the third hour. What was its average speed per hour for the three hours?

12. The average annual rainfall at Des Moines, Iowa, is 32.45 inches. What is the average monthly rainfall?

13. Find the average monthly rainfall for each city:

City	Average Annual Rainfall
Miami, Florida	59.52 in.
Denver, Colorado	14.02 in.
Atlanta, Georgia	49.36 in.
Indianapolis, Indiana	41.48 in.
Detroit, Michigan	32.16 in.
St. Paul, Minnesota	28.68 in.

Add these columns:

1	2	3	4
4980	1892	2670	3633
2939	6638	8593	7895
8786	3199	1469	3936
2056	2162	1506	2159
1342	5008	4244	7161
5024	1684	8702	5121
3325	9201	8238	1159
9426	7913	1245	6411

Zeros in the Quotient

When the divisor is a whole number we must always have as many decimal places in the quotient as we have in the dividend. Sometimes we have to put zeros just after the decimal point in the answer in order to get the number of places we need, as in cases like the following:

Examples

(*A*) Find $\frac{1}{4}$ of .08.

$$4\overline{).08} \quad .02$$

(*B*) Divide .625 by 25.

$$25\overline{).625} \quad .025$$

50

125

125

Work the examples that follow. Be sure to put in the right number of zeros in the quotient.

	(1)	(2)	(3)
(*A*)	$1.28 \div 16 = ?$	$.9 \div 90 = ?$	$.09 \div 30 = ?$
(*B*)	$.0345 \div 15 = ?$	$.02 \div 25 = ?$	$.256 \div 16 = ?$
(*C*)	$.324 \div 18 = ?$	$.5 \div 8 = ?$	$.0625 \div 25 = ?$
(*D*)	$.0375 \div 75 = ?$	$.054 \div 9 = ?$	$.096 \div 24 = ?$
(*E*)	$1.80 \div 60 = ?$	$22.50 \div 75 = ?$	$.0025 \div 5 = ?$

Dividing by 10, 100, 1000, and 10000

$2155. \div 10 = 215.5$ $\quad$ $60. \div 10 = 6$

$2155. \div 100 = 21.55$ $\quad$ $60. \div 100 = .6$

$2155. \div 1000 = 2.155$ $\quad$ $60. \div 1000 = .06$

$2155. \div 10000 = .2155$ $\quad$ $60. \div 10000 = .006$

These statements show a short method of dividing by 10, 100, 1000, and 10,000. All we have to do is to move the decimal point to the left. When we divide by 10 we move the decimal point one place to the left. When we divide by 100 we move the point two places to the left. How many places to the left do we move the point when we divide by 1000? How many when we divide by 10,000? Note that we use zeros when there are no other figures to fill the places.

Solve these problems. Divide by moving the point when you can.

1. Beads sell at the rate of 100 for 65 cents. What is the cost of a single bead?

2. Bolts sell at 58 cents per 100. What is the cost of one bolt?

3. James Carter raises chickens. He buys bone builder for them at $3.45 per hundred pounds. How much does the bone builder cost him per pound?

Give the answers without using pencil and paper:

	(1)	(2)	(3)	(4)
(*A*)	$56 + 3 = ?$	$45 + 6 = ?$	$49 + 2 = ?$	$56 + 2 = ?$
(*B*)	$45 + 4 = ?$	$64 + 7 = ?$	$45 + 3 = ?$	$81 + 8 = ?$
(*C*)	$72 + 7 = ?$	$81 + 6 = ?$	$64 + 6 = ?$	$72 + 6 = ?$
(*D*)	$81 + 4 = ?$	$64 + 5 = ?$	$72 + 4 = ?$	$81 + 3 = ?$
(*E*)	$64 + 4 = ?$	$72 + 3 = ?$	$81 + 2 = ?$	$64 + 2 = ?$
(*F*)	$17 + 8 = ?$	$31 + 5 = ?$	$22 + 7 = ?$	$37 + 2 = ?$
(*G*)	$22 + 9 = ?$	$17 + 7 = ?$	$29 + 6 = ?$	$18 + 8 = ?$

4. What is the cost of a single cartridge when they sell at 50 cents per 100?

5. Rope for clothesline sells at 72 cents per 100 feet. How much is this for 1 foot?

6. What is the value of a single clothespin when you can buy 100 clothespins for 24 cents?

7. Poultry fencing sells at $5.75 for 10 rods. How much is this a rod?

8. What is the cost of 1 brick when bricks are selling at $15.00 per M? (M means 1000.)

Give the answers without using pencil and paper:

	(1)	(2)	(3)	(4)
(*A*)	$16 + 9 = ?$	$29 + 5 = ?$	$18 + 9 = ?$	$16 + 3 = ?$
(*B*)	$28 + 7 = ?$	$13 + 9 = ?$	$28 + 6 = ?$	$19 + 9 = ?$
(*C*)	$13 + 8 = ?$	$26 + 9 = ?$	$22 + 7 = ?$	$13 + 6 = ?$
(*D*)	$26 + 8 = ?$	$12 + 5 = ?$	$26 + 7 = ?$	$22 + 9 = ?$
(*E*)	$12 + 4 = ?$	$23 + 7 = ?$	$25 + 8 = ?$	$11 + 2 = ?$
(*F*)	$23 + 9 = ?$	$24 + 2 = ?$	$3 + 8 = ?$	$24 + 9 = ?$

1. Mary Brooks had 36 candles. She used 12 of them on her birthday cake. She expected to have 25 candles left for Christmas. Will she have as many as that? Prove your answer.

2. Sam Barnes will need an overcoat four weeks from now. The overcoat will cost $24.00. Sam has no money, but he plans to save $4.25 a week for the next four weeks. Will Sam have enough money to buy the overcoat four weeks from now? If not, how much more money will he need?

9. Maple flooring costs $145.00 per thousand feet. How much is this per foot?

10. If it costs $5.75 to shingle 100 square feet of a roof, how much does it cost to shingle 1 square foot?

---

1. $1576 + 1866 = ?$

2. Martha Mayes had a box containing 110 peaches. She now has only 10 peaches left. How many peaches are missing from Martha's box?

3. Ninety-six cents is how many times 12 cents?

4. How many 12-inch lengths are there in a piece of wire 3 yards long?

5. What is the cost of 4 suits of clothes at $39.75 each?

6. How many quarts are there in 468 pints?

CHAPTER V

USING DECIMALS

PERCENTAGE

Decimal fractions of two places are used very frequently in multiplication and division. This means that we multiply and divide by hundredths much more often than we do by tenths, thousandths, or ten thousandths. The word "hundredths" is hard to speak or write, so we generally use an easier name. You have often heard it. The name is **per cent.** It means exactly the same as hundredths. From now on we shall use the name "per cent" most of the time. We often use a sign for the name "per cent." This is the way it looks: **%.** It always means per cent, or hundredths. Thus .12, 12%, and 12 per cent all mean the same; and .06, 6 per cent, and 6% all mean the same.

1. How many feet are there in 79 yards?

2. Mrs. Rankin bought 24 bars of soap that were on sale at 50 cents a dozen. She gave the storekeeper a 2-dollar bill. How much change should she receive?

3. Find the product of 280 and 34689.

4. There are 144 things in a gross. A grocer ordered one gross packages of cereal. The goods came in 4 boxes of equal size. How many packages were there in each box?

5. Thirty-eight is how many times 19?

Rewrite each of the following decimal fractions as per cent, using the new sign:

	(1)	(2)	(3)	(4)	(5)
(*A*)	.25	.33$\frac{1}{3}$	.03$\frac{1}{3}$	.50	.15
(*B*)	.07$\frac{1}{2}$	.14	.95	.03$\frac{1}{2}$	.04$\frac{1}{4}$
(*C*)	.16$\frac{2}{3}$	.12$\frac{1}{2}$	.20	.06$\frac{1}{4}$	.01$\frac{7}{8}$
(*D*)	.37$\frac{1}{2}$	.62$\frac{1}{2}$	.87$\frac{1}{2}$	.03$\frac{1}{8}$	.66$\frac{2}{3}$
(*E*)	.83$\frac{1}{3}$	.23	.11$\frac{3}{4}$	.80	.75
(*F*)	.40	.09$\frac{1}{4}$	.60	.85	.45$\frac{5}{8}$

Find the differences:

1	2	3	4	5
1788	884	1485	1126	1445
297	216	889	637	797

6. Mr. Walker has just sold 200 cattle from one ranch and 75 from another. He has left 588 cattle on the first ranch and 875 on the second. How many cattle did he have on both ranches before he sold any of them?

7. There are 6992 orchid plants in a southern garden. They are set out in 152 rows. How many plants are there in each row?

8. 3531 − 3144 = ?

9. Mr. Barnes averages 27 miles per hour when he drives his car. How far can he go in 68 hours of driving time?

10. William Burnet is a crippled boy. He buys Christmas cards and sells them at 25 cents each. William has just paid for $7.00 worth of cards. How many cards must he sell to get his $7.00 back?

11. Multiply 67890 by 176.

Changing Per Cents to Decimals

To change per cents to decimals we leave off the per-cent sign and put in a decimal point so that there will be two decimal places. We use zeros, if necessary, thus:

$25\% = .25$ $\qquad$ $1\frac{1}{2}\% = .01\frac{1}{2}$

Change the following per cents to decimal fractions:

	(1)	(2)	(3)	(4)	(5)
(*A*)	60%	150%	7%	$3\frac{1}{3}\%$	$1\frac{1}{2}\%$
(*B*)	75%	100%	$4\frac{3}{4}\%$	$5\frac{1}{8}\%$	$3\frac{1}{4}\%$
(*C*)	25%	$33\frac{1}{3}\%$	$37\frac{1}{2}\%$	$6\frac{1}{4}\%$	1%

How to Find Percentages

Example. What is 6% of \$300?

$6\% = .06$ $\qquad$ $.06 \times \$300 = \$18.00$

The answer in an example like this is called the **percentage**. To find the percentage change the per cent to a decimal fraction and multiply. Be sure to put a decimal point in your answer.

---

1. Which is larger, a lot 50 feet by 120 feet or one 60 feet by 105 feet? How much larger?

2. How much is $8756 \div 84$?

3. What is the cost of 1 hat when 3 dozen hats cost \$171.00?

4. A company has 6 boats, each of which will carry 56 persons. How many people can all 6 boats carry on one trip?

5. How many quarts are there in 9.64 gallons?

Find the percentages:

1. *a.* 75% of 60 bu.
   b. 20% of 10 gal.
   c. 6% of $500.
   d. 25% of $200.

2. *a.* 15% of 900 lb.
   b. 10% of $30.
   c. 90% of $150.
   d. 45% of 3750 sq. in.

3. *a.* 4% of $2500.
   b. 15% of 1750 lb.
   c. 80% of 10 lb.
   d. 35% of 5280 ft.

4. *a.* 2% of 2500 gal.
   b. 17% of 5000 bu.
   c. 55% of 320 rd.
   d. 9% of 215 lb.

Some very important per cents are given here. Memorize these facts if you do not already know them.

$16\frac{2}{3}\% = \frac{1}{6}$	$25\% = \frac{1}{4}$	$20\% = \frac{1}{5}$	$62\frac{1}{2}\% = \frac{5}{8}$
$14\frac{2}{7}\% = \frac{1}{7}$	$10\% = \frac{1}{10}$	$66\frac{2}{3}\% = \frac{2}{3}$	$8\frac{1}{3}\% = \frac{1}{12}$
$50\% = \frac{1}{2}$	$37\frac{1}{2}\% = \frac{3}{8}$	$33\frac{1}{3}\% = \frac{1}{3}$	$6\frac{1}{4}\% = \frac{1}{16}$
$11\frac{1}{9}\% = \frac{1}{9}$	$87\frac{1}{2}\% = \frac{7}{8}$	$12\frac{1}{2}\% = \frac{1}{8}$	$75\% = \frac{3}{4}$

Example. Find $16\frac{2}{3}\%$ of 96.

Since $16\frac{2}{3}\% = \frac{1}{6}$, $16\frac{2}{3}\%$ of 96 is $\frac{1}{6}$ of 96, or 16.

Work the following examples in the same way:

(1)	(2)
(*A*) $6\frac{1}{4}\%$ of 80	$62\frac{1}{2}\%$ of 24 A.
(*B*) $33\frac{1}{3}\%$ of $1.80	$16\frac{2}{3}\%$ of 35 gal.
(*C*) $12\frac{1}{2}\%$ of $56.00	$66\frac{2}{3}\%$ of 43560 sq. ft.
(*D*) $87\frac{1}{2}\%$ of $200.00	$8\frac{1}{3}\%$ of 36 qt.
(*E*) $66\frac{2}{3}\%$ of 5280 ft.	20% of 80 lb.

How to Figure Discounts

The business man often wishes to reduce the prices of certain articles. In the first place, he may have goods left on his hands which he cannot easily sell. In the second place, he often sells goods in large quantities cheaper than he does in small quantities. In the third place, some of his goods may lose part of their value before he can sell them. Fruit that spoils and goods that are damaged by fire or water are examples of this sort of thing. All such goods are usually sold at less than the regular price.

The amount that is "knocked off" from the original price is called the **discount.** Discounts are usually stated in per cents. A certain per cent of the original price is subtracted from it. The remainder is the new selling price. The per cent of discount is often spoken of as "per cent off." Thus 10% off means 10% discount.

Problem. Bath towels are selling at 25 cents each. But if a customer buys 5 towels at a time, he is allowed 20 per cent discount. How much does he save by buying 5 towels at once instead of one towel at 5 different times? How much must he pay for the 5 towels if he buys them all at once?

5 towels at 25 cents each would sell at $1.25.

20% discount on $1.25 = .20 × $1.25 = $.2500, or 25¢.

---

1. Ralph Barlow has $75.00 in his savings account and $100.00 in his checking account. Which account has more money in it? How much more?

2. 8393 − 994 = ?

3. Forty-five days is what part of 360 days?

The amount which the customer saves is 25 cents; \$1.25 less 25 cents equals \$1.00, the amount actually paid for the 5 towels.

Problem. What do you have to pay when you buy a pair of shoes worth \$5.40 at $16\frac{2}{3}\%$ discount?

$16\frac{2}{3}\% = .16\frac{2}{3} = \frac{1}{6}$. $\frac{1}{6} \times \$5.40 = \$.90$, or $90¢$.

$\$5.40 - \$.90 = \$4.50$ (the amount you have to pay).

Getting Ready for a Sale

James Murphy works in his father's dry-goods store in the summer time. The store is planning to put on a big sale. Everything is to be sold at 40% off. James is making large cards for the sale. They look like this:

BOYS' ALL-WOOL SUITS

Regular price	\$15.00
Sale price	9.00

James knew the regular prices. He figured 40% of the regular price and subtracted it from the regular price to get the sale price.

Subtract the following:

1	2	3	4	5
7808	11319	1196	967	1034
900	2890	870	78	900

6. How many pounds are there in 52902 ounces?

7. How many quarts are there in 2460 gallons?

8. How many 10-cent purchases can you make with 80 cents? with \$1.20? with \$2.30?

Play that you are helping James. Find what sale price to put on the card for each of the following:

1. Arm bags at $1.50 each, regular price.
2. Awning cloth at 40¢ a yard, regular price.
3. Bathing suits at $2.00 each, regular price.
4. Bath robes at $4.75 each, regular price.
5. Bedspreads at $3.50 each, regular price.
6. Beaded bags at $4.00 each, regular price.
7. Belts at 75¢ each, regular price.
8. Bibs, six for 25¢, regular price.
9. Blouses at $1.20 each, regular price.
10. Rubber boots at $5.00 a pair, regular price.

While James was getting the sale prices his father came by. He stopped and watched. Soon he said: "Let me show you a shorter way to find the sale prices. You remember that per cent means hundredths. Then 100% of anything will mean all of it. Since we are going to give a discount of 40%, the price will be 40% less than the regular price. Now 100% is the regular price. Forty per cent

---

1. How many square feet are there in 963 square yards?
2. Mr. Shulk ships oranges in small boxes that contain 150 medium-sized oranges. He packs the oranges in layers that are 5 oranges long and 5 oranges wide. How many layers does Mr. Shulk put into each box?
3. How many quarts are there in 4562 pecks?
4. How many gallons are there in 1396 quarts?

less would be 60%. So all that you have to do is to take 60% of the regular price. That will give the sale price very quickly." James was afraid that his father was joking, and so he figured two or three cases over again. Work examples 9 and 10 on page 188 by the shorter method. Was James's father joking?

Find the sale prices at 40% discount on the following regular prices by the shorter method:

1. Brief cases at \$5.00 each.
2. Braid at 12 yd. for 45¢.
3. Veils at 60¢ each.
4. Voile 39 in. wide at 46¢ per yard.
5. Trunks at \$12.00 each.
6. Umbrellas at \$4.00 each.
7. Linen tablecloths 55″ × 55″ at \$3.25 each.
8. Satchels at \$11.00 each.
9. Velvet rugs 9′ × 12′ at \$33.00 each.
10. Raincoats at \$18.00 each.

Find the remainders:

1	2	3	4	5
30	$111\frac{1}{8}$	100	$103\frac{3}{5}$	100
$16\frac{2}{3}$	$39\frac{3}{8}$	$18\frac{3}{4}$	$95\frac{4}{5}$	$98\frac{1}{4}$

6. There were 754 children at our school picnic. Two hundred seventy-five of the children walked to the picnic. The rest came on the street car. How many children came on the street car?

Problems on Discounts and Saving

Solve the following problems about saving money by taking advantage of discounts. Save your answers.

Mary Garner buys groceries for her mother. It is understood that Mary must buy good things, but she is allowed to take advantage of any discounts that she can find. Mary's mother allows her to keep all the money she saves in this way.

How much money does Mary save in each of the following cases?

1. When she buys a dozen cans of asparagus for \$3.60 at $16\frac{2}{3}\%$ discount instead of paying 30 cents for each can one at a time?

2. When she buys 6 bottles of catsup for \$1.20 at 20% off instead of paying 20 cents per bottle as when bought one at a time?

3. When she buys a dozen cans of California cherries for \$4.80 at 10% off instead of paying 40 cents a can as when bought one at a time?

---

1. Bert Carson and Tom Lawson are hiking across the country. They get rides when they can. They traveled 4704 miles in 56 days. What was their average per day?

2. How many yards of silk at \$2.87 a yard can you buy for \$614.18?

3. How many inches are there in 36 feet?

4. How many ounces are there in 6.84 pounds?

5. Find the quotient when 35884 is divided by 78.

4. When she buys a dozen jars of olives for \$3.00 at 5% off instead of paying 25 cents a jar as when bought one at a time?

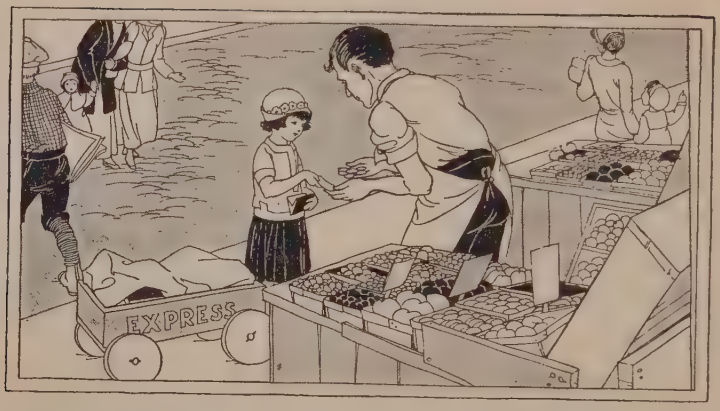
5. When she buys a dozen cans of peas for \$1.68 at $12\frac{1}{2}\%$ off instead of paying 14 cents a can as when bought one at a time?

6. When she buys a dozen cans of tomatoes for \$1.56 at 4% off instead of paying 13 cents a can as when bought one at a time?

7. Mary would like to have a pair of roller skates. She finds a store where \$2.00 roller skates are selling at 20% off. Did Mary make money enough on her grocery purchases to pay for the skates? Prove your answer.

8. One day Mary found some potatoes on sale. Some of the potatoes had spoiled, but many of them were still good. The regular price of potatoes was 10 cents per pound. She bought 25 pounds at a discount of $33\frac{1}{3}\%$ for the potatoes that were spoiled. When she had picked out the good ones, she weighed them. They weighed just $19\frac{1}{2}$ pounds. Find what the $19\frac{1}{2}$ pounds of good potatoes would have cost at the regular price. Did Mary gain or lose when she bought the potatoes on sale? How much?

9. At another time Mary bought a bushel of apples at 75 cents a peck. She was allowed a discount of $16\frac{2}{3}\%$ because some of the apples were imperfect. When she picked out the perfect ones, she had three pecks. What would the three pecks have cost at the regular price? Did Mary gain or lose when she bought the apples on sale? How much?



10. Dealers in fresh fruits do not like to keep fruit in their stores over Sunday. Sometimes they put on a fruit sale on Saturday night. Last Saturday night Mary found a fruit market which sold fruit at $33\frac{1}{3}\%$ off after six o'clock. The market was $\frac{1}{2}$ mile from Mary's home, but she had a little wagon which she took with her to haul the fruit in. She bought:

4 dozen red plums, at 30¢ a dozen, regular price.

2 gal. of cherries, at 15¢ per quart, regular price.

6 qt. of blackberries, at 34¢ per quart, regular price.

How much did Mary save on these three purchases?

---

1. How much will $6\frac{1}{2}$ quarts of cream cost at 40 cents per quart?
2. How many quarts are there in 715.73 pints?
3. How many feet are there in .846 mile?
4. Divide 22468 by 87.
5. How many square rods are there in 76.4 acres?
6. $98190 \div 89 = ?$

Practice Exercises

Add the following columns:

1	2	3	4
8877	8888	7897	7778
4245	8578	6456	3127
6544	3794	8742	4030
4613	1433	3677	9698
7761	6609	5943	9900
2128	2012	3041	1058
4342	4185	6228	3662
133	4300	1005	725

5. Mrs. Drace bought 26 bushels of apples for $88.40. How much did she pay per bushel for the apples?

6. A fifth-grade class of 47 pupils sent flowers to their teacher, who was ill. The flowers cost $2.88. How much should each child pay if they all share the expense equally?

7. Tom Jones had $43.00 when he came to the village. Now he has only $15.00. How much money has Tom spent?

8. How many feet are there in 7089 yards?

9. How many square feet are there in a walk that is 9 feet wide and 672 feet long?

10. Mr. Goodson lives in the country and raises potatoes to sell. Tomorrow he plans to buy supplies as follows:

100 lb. cane sugar at $6\frac{3}{4}$¢ per pound
1 barrel flour at $9.50
1 box prunes, containing 25 lb., at 13¢ per pound

He gets 65 cents per bushel for his potatoes. How many bushels of potatoes will it take to bring enough money to pay for the supplies that Mr. Goodson wants?

11. How many 9-inch lengths are there in $3\frac{1}{4}$ yards of cord?

Money for the Use of Money

It is often necessary for people to borrow money. Banks make a business of lending money, and some individuals lend money. Those who borrow the money are required to pay **interest**. That is, they pay the lender for the use of his money. Interest is always figured as a per cent of the amount of money which is borrowed. The amount borrowed is called the **principal**. The per cent paid as interest is called the **rate**. The amount of interest to be paid depends on how long the money is kept by the borrower. The rate, or per cent, paid means the rate for one year.

Find the sums:

1	2	3
4132	4461	6654
7499	3787	6327
7736	3035	5861
2452	6943	7626
1724	2326	2383
4245	6562	4519
3118	1011	3147
4991	7545	2361

4. At 6.5 miles per hour, how far can a horse go in 2.4 hours?

5. Subtract $44\frac{4}{9}$ from 60.

6. John and Joseph White are picking apples. John has picked $7\frac{1}{2}$ bushels of apples and Joseph has picked $6\frac{3}{4}$ bushels. Which boy has picked more? How much more?

Problem. Find the interest on \$300 for 2 years at 7%.

Seven per cent of \$300 is \$21.00. This is the interest for 1 year. The interest for 2 years will be twice as much as that for 1 year, or \$42.00. *Ans.*

> To find the interest, multiply the principal by the rate. Then multiply the result by the time expressed in years or parts of a year.

Something to Do

Copy this form in your tablet:

Examples	Principal	Rate	Time
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			

1. How many feet are $\frac{1}{2}$ of 94 feet?

2. What part of 120 is 75?

3. How many 18-inch lengths are there in 342 feet?

4. There are 26 working days in a month. How many hours per month does a man work who works 8 hours a day?

5. Find the cost of 789 pounds of butter at 49 cents a pound.

Now read the first of the following examples and write under the word Principal the right number of dollars for example 1. Write under the word Rate the per cent given in example 1. Then write under the word Time the figure that tells the length of time in example 1. Do the same for all the examples.

Do not work these examples until you have done what was asked for in the preceding paragraph. Then work them out, being sure to put the decimal point in the right place in your answer.

Find the interest on each of the following amounts for the time and rate given:

1. \$400 for 3 years at 7%.
2. \$250 for 5 years at 6%.
3. \$5000 for 6 years at 5%.
4. \$10000 for 10 years at $4\frac{1}{2}$%.
5. \$750 for 2 years at $3\frac{3}{4}$%.
6. \$900 for 4 years at 6%.
7. \$1000 for 5 years at 5%.
8. \$800 for 1 year at 7%.
9. \$150 for 2 years at 6%.
10. \$90 for 2 years at 7%.

---

1. Nancy Long had \$129.33 in the bank. She checked out \$39.46. How much did Nancy have left in the bank?

2. Mrs. Arnold wants to buy a trunk that costs \$57.85. She now has only \$22.86. How much more money does Mrs. Arnold need?

Money is frequently borrowed for less than one year. When this is the case we must find for what part of a year the money is used. When interest is figured, a year is counted as 12 months of 30 days each, or 360 days. Do you know the parts of a year? What part of a year is 4 months? 6 months? 30 days? 2 months? 60 days? 9 months? 90 days? 1 month? 45 days? 3 months? 5 months? 8 months? 10 months?

Example. Find the interest on \$400 for 60 days at 7%. The interest on \$400 at 7% for 1 year = .07 × \$400 = \$28.00. 60 da. = $\frac{60}{360}$ yr. = $\frac{1}{6}$ yr. $\frac{1}{6}$ of \$28.00 = \$4.66. This is interest due for 60 days on \$400 at 7%.

> In figuring interest a fraction of a cent is dropped.

Give the answers without using pencil and paper:

	(1)	(2)	(3)	(4)
(*A*)	25 + 8 = ?	48 + 4 = ?	25 + 9 = ?	48 + 5 = ?
(*B*)	63 + 2 = ?	81 + 2 = ?	27 + 8 = ?	63 + 5 = ?
(*C*)	28 + 9 = ?	63 + 6 = ?	81 + 3 = ?	49 + 2 = ?
(*D*)	63 + 7 = ?	81 + 4 = ?	21 + 5 = ?	81 + 6 = ?
(*E*)	49 + 3 = ?	21 + 8 = ?	81 + 7 = ?	49 + 4 = ?
(*F*)	22 + 8 = ?	29 + 7 = ?	49 + 5 = ?	64 + 2 = ?
(*G*)	81 + 7 = ?	22 + 9 = ?	29 + 8 = ?	81 + 8 = ?
(*H*)	64 + 3 = ?	29 + 9 = ?	42 + 4 = ?	64 + 5 = ?
(*I*)	23 + 8 = ?	42 + 5 = ?	54 + 2 = ?	23 + 9 = ?

1. Bobby Sweet saved \$323.56 in 48 weeks. What was his average per week?

2. How many square rods are there in 640 acres?

Find the interest on each of the following amounts for the time and rate given:

1. \$200 for 90 days at 7%.
2. \$500 for 8 months at 5%.
3. \$8000 for 10 months at $4\frac{1}{2}$%.
4. \$60 for 30 days at 6%.
5. \$150 for 60 days at 6%.
6. \$600 for 2 years 6 months at 7%.
7. \$1000 for 18 months at 6%.
8. \$450 for 5 months at 7%.
9. \$700 for 1 year 7 months at 6%.
10. \$365 for 45 days at $4\frac{3}{4}$%.

"What Per Cent" Exercises

"What per cent" problems and examples are much like two other kinds that you have already had. Do you remember how to do the "what part of" exercises? You should review these because they will help you to learn the "what per cent" kind.

1. Mr. Nash paid his grocery bill with a check for \$52.74. The amount of the bill was \$16.81. How much change should Mr. Nash receive?

2. Mr. Grimes has just received 18 cases of cereal for his grocery store. There are 36 boxes in each case. Mr. Grimes expects to sell the cereal at 15 cents per box. How much will he receive for the 18 cases if he sells all the boxes?

3. $745632 \div 864 = ?$

4. How many feet are there in 2.9 miles?

Review of "What Part Of" Exercises

1. Twelve is what part of 16?

2. Seventy-five is what part of 100?

3. Three thousand nine hundred sixty is what part of 5280?

4. Twenty-eight quarts are what part of 32 quarts?

5. Two hundred forty acres are what part of 640 acres?

6. Forty-five days are what part of 360 days?

7. Twenty-eight weeks are what part of 52 weeks?

8. Two hundred fifty dollars are what part of $1000?

9. Thirty-five pounds are what part of 50 pounds?

10. One hundred thirty-two square inches are what part of 1 square foot?

In this kind of exercise you put the smaller number above the larger one and reduce the fraction thus formed to its lowest terms. In finding "what per cent," instead of putting the smaller number above the other, you use the smaller number as a dividend and divide it by the

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1. Street car number 519 runs all day. On Thursday 310 people rode on this car in the morning, 338 people rode on it in the afternoon, and 458 in the evening. Seven hundred thirty-eight of these people paid full fare, which was 6 cents. The remainder rode for half fare. How much money was taken in on this car during the whole day?

2. One bushel of potatoes costs 98 cents at our market. At this price how many bushels of potatoes can be bought for $23.55? How much money will be left over?

larger number as divisor. The number that comes after "of" is always the divisor. In the following exercises the divisor will be larger than the dividend. You have already had cases of this sort when you reduced common fractions to decimals. The "what per cent" exercises are solved in much the same way.

Problem. What per cent is \$250 of \$1000?

If this were a "what part of" problem we should put the \$1000 under the \$250. Now we must divide \$250 by \$1000 and write it like this: \$1000)\$250. But we cannot divide, because \$250 is less than \$1000. We can, however, write a decimal point after \$250 and add two zeros. Then we can divide, but we must remember to put two decimal places in the answer. We always put a decimal point in the answer just above the decimal point in the dividend. So we write it in this form:

```
          .25
$1000)$250.00
      200 0
       50 00
       50 00
```

.25, or 25%. *Ans.*

To find what per cent one number is of another, divide the first number by the second number. Add a decimal point and two zeros to the dividend. Then divide as in whole numbers. If there is a remainder, write it as a fraction in the answer. Change all such fractions to their lowest terms.

Easy Exercises

Find what per cent the first number is of the second in each exercise:

	(1)		(2)	
(*A*)	$6,	$600	9,	27
(*B*)	10,	64	$14,	$16
(*C*)	20,	60	18,	48
(*D*)	50,	100	1 cent,	2 cents
(*E*)	25,	38	150,	600

1. Kate Hogan took 13 dozen eggs to town to sell. The road was rough and 19 eggs were broken. What was the per cent of loss?

2. There are 6 schools in Prairie Township. The township board offered a prize to the school that had the best attendance during January. There were 20 school days in January. The teacher in each school made a record of the number of pupils present and the number absent for each

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Give the answers without using pencil and paper:

	(1)	(2)	(3)	(4)
(*A*)	$64 + 7 = ?$	$24 + 6 = ?$	$31 + 2 = ?$	$54 + 4 = ?$
(*B*)	$24 + 8 = ?$	$32 + 5 = ?$	$45 + 2 = ?$	$54 + 5 = ?$
(*C*)	$45 + 4 = ?$	$54 + 7 = ?$	$24 + 9 = ?$	$45 + 5 = ?$
(*D*)	$33 + 7 = ?$	$45 + 6 = ?$	$56 + 2 = ?$	$72 + 2 = ?$
(*E*)	$45 + 7 = ?$	$72 + 3 = ?$	$32 + 7 = ?$	$45 + 8 = ?$
(*F*)	$72 + 4 = ?$	$45 + 8 = ?$	$56 + 3 = ?$	$72 + 5 = ?$
(*G*)	$56 + 5 = ?$	$72 + 6 = ?$	$48 + 2 = ?$	$56 + 6 = ?$
(*H*)	$72 + 7 = ?$	$56 + 7 = ?$	$72 + 8 = ?$	$19 + 7 = ?$

of the 20 days. Then the teachers added the number present each day for 20 days and the number absent each day for 20 days to get the totals. This is what they found:

School	Total Present	Total Absent
a. Midland	866	154
b. Plainview	377	83
c. Rolling Green	730	110
d. Hazel Dell	369	51
e. Plum Grove	454	166
f. Union	783	117

Which school got the prize? How do you know?

3. Mary, Frances, Jane, Grace, and Martha took a test today in school. Thirty-seven questions were asked. The following record shows what each girl did:

Name	Right	Wrong
a. Mary	33	4
b. Frances	29	8
c. Jane	35	2
d. Grace	28	9
e. Martha	27	10

Find the per cent of answers that each girl had right.

Find the differences:

1	2	3	4	5
803	816766	93912	91282	8341
694	369990	26384	55990	1699

6. Mr. Glover earns $3.68 per day. How much can he earn in 89 working days?

Review Exercises I

Add these amounts:

1	2	3
$326.40	$177.70	$649.90
568.92	656.44	452.79
289.53	276.66	814.44
435.66	413.18	817.83
724.43	524.56	328.08
877.17	271.29	280.06
124.29	44.11	193.24
440.59	502.81	.01

4. Roger Black can wash 6 ordinary-sized windows in one hour. If he works 8 hours every day at washing windows, how many windows can he wash in 6 weeks?

5. What part of a cubic foot is 1440 cubic inches?

6. Mrs. Ayres gave the iceman a check for $9.48 in payment for 1000 pounds of ice at $47\frac{1}{2}$ cents per 100 pounds. How much change should she receive?

7. Ruth Gladden would like to buy a set of toys for the Children's Home. The set that she wants costs $3.53 and Ruth has only $2.10. How much more money does she need?

8. How much will 25 dozen eggs cost at 56 cents a dozen?

Review Exercises II

Find the remainders:

1	2	3	4	5
6931	10227	1423	7122	81655
1598	6610	988	4996	14799

6. Arthur Pence ordered goods as follows:

1 bicycle	$45.00
1 pair tennis shoes	2.98
1 bathing suit	4.75
1 book	2.50

When the goods came, the shoes, bathing suit, and book were missing. How much should Arthur pay for the goods he received?

7. Martha Scruggs bought a box containing 82 apples. The next day only 74 of Martha's apples were left. How many apples were missing?

Find the remainders:

8	9	10	11	12
74555	9421	55343	9511	84167
14990	1534	15400	6694	61210

13. How many quarts are there in 987.24 gallons of milk?

14. There are 926 people in our village. Two hundred sixty-two of these people go to school. How many do not go to school?

15. How many pints are there in 5.7 gallons?

16. $424103 \div 87 = ?$

17. $944 - 399 = ?$

18. $9876 \times 78 = ?$

19. $324 + 270 + 374 = ?$

Review Exercises III

Find the sums:

1	2	3
$43.10	$454.31	$316.50
59.79	808.56	289.93
82.56	146.74	742.49
76.74	362.59	513.35
25.36	30.75	256.63
53.43	174.12	460.58
36.06	40.06	632.05
12.95	79.86	697.35

4. Mr. Borden has 38 boxes, each of which contains about 88 apples. How much will these apples bring at 45 cents a dozen?

5. From my home it is 80 miles to Milwaukee and 135 miles to Chicago. Which city is farther away? How many miles farther?

6. Mr. Gray has two bank accounts, one in New York City and one at home. He has $4976.67 in his home bank and $6957.89 in the New York bank. How much money has Mr. Gray in both banks?

7. Sam Lawson earns 75 cents a day dragging hay with his horse. How much money can Sam earn in 30 working days at that rate?

8. How many feet are there in 3.21 miles?

9. Find the quotient of 72438 divided by 92.

10. How many quarts are there in 17 pints?

Review Exercises IV

1. Kate Brown saved $495.38 in 94 weeks. What were her average savings per week?

2. How many tulip bulbs at $5.25 per dozen can be bought with $189.00?

3. Mr. Brewster and his family drove their car for 12 hours yesterday. Their speedometer registered 10645 when they started and 10823 when they stopped. How many miles did Mr. Brewster average per hour while he was driving?

4. The following is Mr. Crane's bill for repairs on his house:

Roofing	$175.00
Painting	849.42
Lighting fixtures	75.35
Plumbing	49.20

What is the total of his bill?

5. How many quarts are there in 940 pecks?

6. Roberta Bascom wants to buy a pair of tennis shoes for $3 in three weeks. She plans to save 75 cents a week for the next three weeks and to ask her father for the rest. How much is she going to ask her father to give her?

7. Mr. Maxwell bought a lot for $906. He built a house on it which cost $6956 and a garage which cost $565. He also spent $67 for shrubbery. How much did Mr. Maxwell spend in all?

8. A gallon of milk weighs 8.6 pounds. How many ounces is that?

9. Divide 99684 by 678.

10. $1980 - 1008 = ?$

Review Exercises V

Find the differences:

1	2	3	4	5
\$13.06	\$67.54	\$9.61	\$168.02	\$78.98
3.97	39.66	2.93	92.23	19.99

6. Mr. Johnson has just lost \$496.75 in business. He still has \$496.75 left. How much money did Mr. Johnson have at first?

7. What is the cost of 1 pair of knitted gloves when 48 pairs cost \$47.52?

8. How many pint bottles will be needed to contain 732 quarts of grape juice?

9. The community chest needs \$764.40. Ninety-eight school pupils agree to raise the money. How much must each pupil raise if they all agree to raise equal amounts?

10. How many 37-cent articles can I buy with \$41.07?

Find the products:

11	12	13	14	15
1369	3700	963	865	7852
267	856	726	370	234

16. Mr. Frank and his family took a long vacation trip in their car. They kept count of the number of hours which they spent in driving. When they got home they had driven 196 hours and had gone 4704 miles. What was their average number of miles per hour?

17. How many square feet are there in 321 square yards?

Review Exercises VI

Find the products:

1	2	3	4
98763	76320	2146	98721
79	359	31	568

5. Old Dobbin goes 9380 feet in 70 minutes. What is his average number of feet per minute?

6. If a train averages 41 miles per hour, how far will it go in 65 hours?

Subtract these numbers:

7	8	9	10	11
7898	17869	14348	13787	62052
2999	9771	6000	9911	8911

12. It is 135 miles from our village to the city. The local train makes this run in 5 hours. What is its average rate per hour?

13. Mr. Larkin has a dry-goods store. In one order of men's suits he found two hundred thirty-one dollars' worth of suits missing. He paid $1907 for those that came. How much would his bill have been if all the suits had come?

14. How many pecks are there in 688 bushels?

15. $10964 - 3271 = ?$

16. How many 18-inch lengths of wire can be cut from a piece of wire $46\frac{2}{3}$ feet long?

17. There are 109 pupils in the Logan School. All of them went to the school picnic except 11 pupils who were ill. How many pupils went to the picnic?

Review Exercises VII

Multiply:

1	2	3	4
7451	7130	7899	5786
874	34	69	89

5. Mr. Taylor figures that it cost him $77.42 to raise and harvest his potatoes. How many bushels must he sell at 88 cents per bushel to pay his expenses?

6. One garden is 120 feet long and 33 feet wide. Another garden is 110 feet long and 50 feet wide. Which garden is larger? How much larger?

7. What is the product of 234 and $78.52?

8. How many pounds are there in 168.8 ounces?

9. Denver, Colorado, is 5280 feet above sea level. Colorado Springs is 1720 feet higher than Denver. How high is Colorado Springs above sea level?

10. The area of the window glass in the windows of a schoolhouse should be $\frac{1}{5}$ of the area of the floor. What should be the area of the window glass for a schoolroom 28 feet long and 24 feet wide?

11. $942 - 656 = ?$

12. The total attendance for 28 days in the Hill School was 1478. What was the average attendance per day?

13. Find the difference between 667 and 289.

14. Divide 12456 by 72.

15. How many inches are there in 13.2 feet?

16. What is the difference between 1315 and 787?

Review Exercises VIII

1. A box is 9 inches wide, 15 inches long, and 9 inches deep. How many cubic inches does it contain?

2. Mr. Baker's wheat crop yielded 33 tons. He shipped it in bags containing 150 pounds each. How many bags did it take to hold his entire crop?

3. How much shall I have to pay for $6\frac{1}{2}$ dozen eggs at 48 cents per dozen?

4. How many ounces are there in 9.6 pounds?

5. Mrs. White's chickens cost her $45.68 for 8 months. How many dozen eggs must she sell at 47 cents per dozen to pay her expenses?

6. How many quarts are there in 23.1 gallons of gasoline?

7. How many miles are there in 8844 feet?

8. Divide 784931 by 86.

9. Albert Larson worked 7 hours a day on Monday, Tuesday, and Wednesday. He worked 8 hours each on Thursday and Friday and 4 hours on Saturday. He received 65 cents per hour. How much did he make during the whole week?

10. How many bushels are there in 258 quarts?

11. How many pounds are there in 24 ounces?

Find the remainders:

12	13	14	15	16
$117\frac{1}{16}$	101	$45\frac{1}{12}$	$101\frac{5}{8}$	130
$97\frac{5}{16}$	$98\frac{7}{8}$	$17\frac{5}{12}$	$66\frac{7}{8}$	$89\frac{1}{3}$

Review Exercises IX

Find the differences:

1	2	3	4	5
$117\frac{1}{6}$	125	$101\frac{1}{4}$	80	$102\frac{1}{8}$
$9\frac{5}{6}$	$98\frac{3}{8}$	$98\frac{3}{4}$	$27\frac{1}{6}$	$98\frac{7}{8}$

6. Mrs. James bought 3 coffee cakes at 15 cents each and 2 dozen doughnuts at 13 cents per dozen. She paid with a 1-dollar bill. How much change should she receive?

7. How many inches are there in 14.2 feet?

8. How many weeks are there in 8932 days?

9. Find the quotient: $79\overline{)9875}$

10. Mr. Farmer, a truck gardener, had $\frac{7}{8}$ of an acre of land. Mr. Lane, his neighbor, had $\frac{3}{4}$ of an acre. Which man had more land? How much more?

11. How many ducks weighing on an average 6 pounds each, at 35 cents per pound, will it take to buy a coat which costs $39.90?

12. A coaster wagon costs $5.00. Robert Barnes can save $1.25 in 3 weeks. How much more than this will he need to be able to pay for his wagon 3 weeks from now?

13. A bushel of potatoes weighs 60 pounds. John Ward dug $\frac{1}{4}$ of a bushel of potatoes. Jessie, his sister, dug $\frac{1}{3}$ of a bushel. Which child had more potatoes? How many pounds more?

14. A grocer found that his clerks had left a little vinegar in 3 barrels. There were $2\frac{1}{4}$ gallons in one barrel, $3\frac{3}{4}$ gallons in another, and $5\frac{1}{4}$ gallons in another barrel. How many gallons of vinegar were left in all three barrels?

Review Exercises X

1. Mr. Johnson had 9 tons of hay. He decided to have it baled. If the average weight was 150 pounds per bale, how many bales would he have?

2. Watermelons were 80 cents each. Mrs. Parsons wished $2\frac{1}{2}$ melons. The grocer consented to cut one in halves. How much did Mrs. Parsons pay for the watermelons?

3. Which is more, $\frac{3}{16}$ of a bushel or $\frac{1}{8}$ of a bushel? How much more?

4. How many eggs at 48 cents per dozen will it take to buy 2 yards of dress goods at $2.88 per yard?

5. A pair of skates costs $3.75. I can save 75 cents per week for 4 weeks. How much more will I need in order to buy the skates 4 weeks from now?

6. Which is larger, a field 80 rods square or one 75 rods by 85 rods? How much larger?

7. How many quarts are there in 6 gallons and 3 quarts?

8. John gathered $\frac{2}{3}$ of a dozen eggs per day for one month of 30 days. How many eggs did he gather in all?

9. What is the volume of a box 36 inches long, 6 inches wide, and 4 inches deep?

10. There are 28 ounces in 1 package of a certain cereal. How many packages will it take to hold one ton of the same cereal?

11. A sun parlor is 18 feet long, 12 feet wide, and 10 feet high. How many cubic feet does it contain?

Review Exercises XI

1. Which is more, $\frac{9}{16}$ of an acre or $\frac{3}{4}$ of an acre? How many square rods more?

2. How many bushels of potatoes at 65 cents per bushel will it take to buy these things for Christmas dinner?

1 dozen oranges at 90¢ per dozen
2 lb. cranberries at $12\frac{1}{2}$¢ per pound
$\frac{1}{2}$ lb. pimento cheese at 50¢ per pound
2 lb. nuts at 55¢ per pound
1 lb. wafers at 45¢ per pound
2 bunches celery at $12\frac{1}{2}$¢ each

3. Mr. Barnes can save $25 a month. He wishes to buy, one year from now, a cottage which will cost $1500. How much money will he have saved to pay on the cottage? How much more will he owe?

4. Which is the larger, a lot 50 ft. × 120 ft. or one 75 ft. × 140 ft.? How much larger?

5. Mr. Blake is a student working his way through the university. He earns 85 cents per hour. In one week he worked as follows:

Monday	1 hr.
Tuesday	$2\frac{1}{2}$ hr.
Friday	$7\frac{1}{2}$ hr.
Saturday	3 hr.

How much did he earn during the week?

6. Two and one-half yards of 36-inch material will make one shirt for a man. How much material of the same width will it take to make 9 such shirts?

Review Exercises XII

1. Ralph Ford has no money now, but he can save $1.20 per week. He wishes to buy a sweater 6 weeks from now which costs $9.00. How much more money will he need besides what he has saved?

2. Which is the larger surface, a table 30 in. × 32 in. or one 47 in. × 32 in.? How much larger?

3. Find the amount of this bill:

3 pt. of oysters at 45¢ a pint
6 bunches of celery at 10¢ a bunch
3 dozen eggs at 58¢ a dozen

4. Three fourths of a yard of material will make a hat. How many yards will it take to make 8 hats?

5. How many bushels of carrots at 65 cents per bushel will it take to buy one whole cheese of 5 pounds at 35 cents per pound and one bag of salt at 20 cents?

6. Mary sews $\frac{3}{4}$ of an hour each day except Sunday. How many hours does she sew in one week?

7. Find the volume of a drawer which is 30 inches long, 14 inches wide, and 6 inches deep.

8. Eighty acres of wheat produced 65 bushels per acre. How many bags holding 150 pounds each would be required to hold the entire crop?

9. What will $18\frac{1}{2}$ bushels of potatoes cost at 80 cents per bushel?

10. How many bushels of onions at 75 cents per bushel will it take to buy 15 pounds of lard at 25 cents per pound?

Review Exercises XIII

1. What is the volume of a candy box that is 3 inches wide, 2 inches deep, and 7 inches long?

2. A scarf is 45 inches long. How many scarfs can be cut from a length of silk $11\frac{1}{4}$ yards long?

3. A boy worked $6\frac{1}{2}$ hours on Saturday at 40 cents per hour. How much money did he earn?

4. How much will it cost to buy $\frac{3}{4}$ of a yard of cloth at 60 cents a yard?

5. Which is more, $\frac{5}{8}$ of a pound or $\frac{1}{4}$ of a pound? How many ounces more?

6. Mrs. Gates wishes to buy a turkey that weighs 15 pounds. Turkeys are selling at 65 cents per pound. How many dozen eggs at 41 cents per dozen must she sell to get money enough to buy the turkey?

7. Find the volume of a packing box 3 feet long, 2 feet wide, and 2 feet deep.

8. Jennie practices her music lesson $3\frac{1}{2}$ hours each day. How many hours does she practice in 28 days?

9. Which is more, $\frac{1}{12}$ of a foot or $\frac{1}{6}$ of a foot? How many inches more?

10. Which is larger, a platform 18 feet long and 9 feet wide or one 24 feet long and 8 feet wide? How much larger?

11. Find the total cost of the following goods:

4 yd. of ribbon at 25¢ per yard
2 pairs of hose at $1.95 per pair
2 union suits at $1.75 per pair

Review Exercises XIV

1. What is the volume of a coal bin that is 13 feet long, 6 feet wide, and 7 feet deep?

2. How many $\frac{1}{2}$ pint glasses must I have to hold 6 quarts of currant jelly?

3. I walk $2\frac{1}{2}$ miles each day. How many miles shall I have walked in 8 days?

4. Which is more, $\frac{1}{3}$ of a yard or $\frac{1}{4}$ of a yard? How many inches more?

5. A gardener sold to a grocer the following vegetables:

7 dozen small cucumbers at 8¢ per dozen
15 lb. spinach at 10¢ per pound
12 lb. tomatoes at 5¢ per pound

The gardener bought of the grocer:

5 lb. rice at 18¢ per pound
3 lb. cheese at 48¢ per pound

How much money should the gardener receive?

6. Which is larger, a lot 34 feet wide and 78 feet long or one 52 feet wide and 72 feet long?

7. If $\frac{1}{2}$ pint of grape juice serves 1 person, how many persons will 3 gallons of grape juice serve?

8. Find the cost of $2\frac{1}{2}$ quarts of ice cream at 45¢ per quart and 3 pounds of wafers at 28¢ per pound.

9. Mr. Bush purchased 16 quarts of red cherries at 17 cents a quart. He sold 8 quarts at 15 cents a quart. How much must he get for the rest of the cherries in order to come out even?

Review Exercises XV

1. One bushel of white potatoes weighs 60 pounds. How many bushels are there in 3 tons of white potatoes?

2. What will $2\frac{1}{3}$ tons of soft coal cost at \$9 per ton?

3. Which is more, $\frac{1}{16}$ of a pound or $\frac{1}{4}$ of a pound? How many ounces more?

4. How many bushels of beets at 60 cents per bushel must I sell to my grocer in order to pay for 2 sacks of flour at \$2.40 per sack?

5. I wish to buy a camera that costs \$5.25. I can save 56 cents a week. In 7 weeks how much more money shall I need in order to buy the camera?

6. Mrs. Jones ordered the following articles:

2 yd. table oilcloth at 37¢ a yard
3 bottles catsup at 25¢ each
4 lb. butter at 58¢ a pound

What is the amount of her bill?

7. White cane sugar is 6.3 cents per pound. How many dozen eggs must I sell at 35 cents a dozen in order to pay for 100 pounds of cane sugar?

8. Which is larger, a room $18' \times 40'$ or one $15' \times 35'$? How much larger?

9. A man working for a contractor was paid 90 cents an hour. He worked 8 hours for 5 days and 4 hours on Saturday. What were his week's wages?

10. What is the volume of a tank 6 feet long, 3 feet wide, and 2 feet deep?

11. Which has the larger surface, a board $22'' \times 14''$ or one $14'' \times 24''$? How much larger?

12. Three yards of 45-inch material will make one dress for a woman. How many dresses can be made out of 1 bolt of material containing 47 yards? How many yards will be left over?

13. Find the volume of a box that is 4 inches long, 2 inches wide, and 2 inches deep.

14. A ribbon is 3 yards long. How many ties 27 inches long can be made from it?

PART II

CHAPTER VI

REVIEW

Fundamental Operations

Most of the trouble that children have in learning arithmetic comes from their having forgotten some things which they had once learned in previous grades. Before you begin the work of the sixth grade you must be sure that you remember what you learned in former grades. You can show that you remember by working correctly the exercises that follow. If some of your answers are wrong, ask your teacher to tell you why you did not get the right answer.

One-Step Problems

1. Find the cost of six sheets at $1.50 each.

2. John Carter wishes to buy a saxophone which costs $70.00. John saves $7 a week. How long will it take him to save enough money to pay for the saxophone?

3. Mary Jones wishes to buy a bicycle which costs $25.00. She has saved $16.50. How much more must she save before she can pay for the bicycle?

4. Jane Harris went shopping for her mother. She bought 5 pounds of sugar for 35¢, a powder puff for 19¢, a comb for 25¢, a thimble for 30¢, a phonograph record for 49¢, a sirup pitcher for 52¢, a table cover for 65¢, a teapot for 75¢, and a feather duster for 98¢. Find the amount of Jane's bill for all these purchases.

5. Eleven boys on our street bought a football for $5.50. How much must each boy pay if the cost is shared equally?

6. Charles Fisher had 15 pigs. His father sold him 12 more. How many pigs has he in all?

7. Mr. Olson has 15 rolls of ribbon in his store. Each roll has 10 yards of ribbon on it. How many yards of ribbon has Mr. Olson in all?

8. Mary Johnson bought a beaded bag for $3.98. She paid for it with a 10-dollar bill. How much change should she receive?

9. How many square rods are there in one fourth of an acre? How many are there in three fourths of an acre?

10. Clarence Turner weighs 92 pounds. Oscar Bush weighs 75 pounds. Which boy weighs more? How much more?

Addition

The answer to an addition problem is called the sum. When you find the sums in the following exercises, see if you can get them all right the first time you try. Begin by adding downward. Check your answers by adding upward.

Find the sums:

1	2	3	4	5	6
	5460	8090	2711	4630	9780
1012	5739	4521	8470	6880	1314
2213	1113	1365	6427	3352	2536
2214	6334	6919	2249	4239	6452
2136	1561	1460	3573	3850	2265
5552	3635	4527	1341	1043	2304
4872	8443	3014	2127	2402	1517
5546	5004	2333	1215	7135	2275
7567	7045	3449	3122	1329	6165
6546	6003	4321	8765	1239	4010

Mixed Problems

1. Ninety-five dollars and 15 dollars are how many dollars?

2. If one pound of bacon costs 60¢, how many pounds of bacon can be bought for $4.80?

3. George Davis planted a bed of onions. The bed was 4 feet wide and 20 feet long. How many square feet are there in George's onion bed?

4. Twenty-four quarts are what part of a bushel?

5. How many feet are there in 150 yards?

6. Helen Bass has $10.00. She plans to spend $7.65. How much money will she have left?

7. William Finch is 12 years old. How old will he be 9 years from now?

8. Mary Smith weighed 65 pounds last summer. She has gained 8 pounds. How much does Mary weigh now?

9. How much is 6 per cent of $300?

10. Our team won 45 per cent of all its games and lost the rest of them. What per cent of the games did it lose?

11. How many badges 8 inches long can be cut from a piece of ribbon 240 inches long?

12. Find the total cost of a cornet at $25.00, a clarinet at $32.50, and a drum outfit for $38.90.

13. How many days are there from July 13 to July 31?

14. How many measuring cupfuls are there in 4 quarts?

15. How many weeks are there in 91 days?

16. The average temperature for October is 52 degrees in my county. On October 20 our thermometer showed a temperature of 60 degrees. How much above the October average is that?

17. Mary Anderson is baking cookies for a party. She has invited 19 guests. If each child, including Mary, is to have 2 cookies, how many must Mary bake?

Subtraction

When you subtract one number from another the answer is sometimes called the difference. Sometimes it is called the remainder.

Find the remainders, or differences, in each of these examples:

	(1)	(2)	(3)	(4)	(5)	(6)
(*A*)	7584	2369	5962	9856	9507	9918
	1352	1005	2739	4607	8352	6090
(*B*)	4185	3518	5524	6674	3597	8720
	3420	2804	4601	1903	703	7546
(*C*)	3641	6128	7040	2317	9704	9680
	2098	4962	6370	1614	2970	1803

Review Problems

1. Find the sum of \$3.00 and \$24.15.

2. How many quarts are there in 32 pints?

3. One hundred forty-four apple trees are to be set out, 18 in a row. How many rows will be set out?

4. Add 2150 bushels and 675 bushels.

5. How much will 7 pounds of tea cost at 65¢ a pound?

6. Our school has 55 pupils. We have just had a picnic. We took 165 apples along with us. How many apples was that for each pupil?

7. School begins at 8 : 50 A.M. It takes Frances 15 minutes to walk to school. At what time must she start for school in order to arrive just on time?

Add these numbers:

1	2	3	4
8612	9761	853442	7899.89
4212	1212	121211	361.98

5	6	7	8	9	10
		1102			
6066	404	256			
5098	4004	5244	5066	4602	2226
511	9596	6765	504	8078	7966
29	7998	7658	9877	2998	7988
112	9878	7657	6898	9879	8598
199	8768	8677	9998	8769	6987

11. How many gallons are there in 60 quarts?

12. How many quarts are there in 60 gallons?

13. How many dollars must be added to $25.00 to make $40.00?

14. How many cents are there in 25 dimes?

15. We rode 150 miles in 6 hours in our car. How many miles was that per hour?

16. What is the difference between $87.00 and $105.50?

17. How many half pints are there in 8 quarts?

18. Anna Carson and Julia Brock have a lemonade stand. They spent $1.35 last Saturday for the lemonade which they sold. How many glasses did they have to sell that day at 5¢ each in order to come out even? in order to make 75¢?

19. 576.7 is how many times 73?

20. Subtract \$98.00 from \$157.00.

21. If 1 inch on a map stands for 15 miles, how many miles does 5 inches stand for?

22. Frank Foster is 58 inches tall this year. Last year Frank was 56 inches tall. How much has Frank gained in height since last year?

Find the differences:

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
(*A*)	6812	7005	1924	8007	9780	6631	8513	8234
	5943	4879	975	7198	8881	2962	2925	4399
(*B*)	7241	7975	8313	2863	8538	9425	6106	7869
	3976	999	3769	999	999	998	997	999

1. Six punching bags can be bought for \$20.68. How much is this per bag?

2. What is the area of a garden which is 40 feet long and 25 feet wide?

3. How many pints are there in 10 gallons?

4. How many 25-cent pieces does it take to make \$6.25?

5. 43 feet – 27 feet = ?

6. How long does it take to go 245 miles at 35 miles per hour?

7. One hundred fifty square yards are how many square feet?

8. Ninety cents are how many times 10 cents?

9. Fifteen cents is contained in \$1.05 how many times?

10. 2019 – 1020 = ?

11. Fountain pens which usually sell at $5.00 each are now selling at $1.25 discount. What is the net price?

12. How far can you go in 7 hours at the rate of 25 miles per hour?

Multiplication

When you multiply two numbers the answer is called the **product.**

Find the products:

	(1)	(2)	(3)	(4)	(5)	(6)
(*A*)	1659	1596	9652	2487	4782	7428
	342	576	98	897	897	897
(*B*)	6519	1695	6195	9156	3956	5369
	506	516	342	342	897	897
(*C*)	9356	9584	5948	4985	3709	6954
	897	897	897	897	604	7009

Review Problems

1. Seventy-five cents divided into 15-cent amounts will make how many of them?

2. For $2.25 you can buy how many 25-cent articles?

3. How many minutes in 6 hours?

4. Five miles are how many feet?

5. Andrew Mason picked 56 quarts of cherries in 8 hours. What was his average per hour?

6. Alice Banner spends 75 cents a day. How many days will $6.00 last her?

7. Ten feet are how many inches?

8. Multiply \$3.75 by 4.

9. Find the product of 13 multiplied by 8.

10. How many miles are there in 21120 feet?

11. Nine hundred square rods are how many acres?

12. $6 \times \$10.25 = ?$

13. Nine hundred inches is how many times 36 inches?

14. What is the discount on \$20 worth of canned fruit at 5 per cent?

Short Division

When you divide two numbers the answer is called the **quotient.** *Find the quotient by dividing each of the following numbers by 9:*

	(1)	(2)	(3)	(4)
(*A*)	320176	896325	525367	614688
(*B*)	390676	146346	204496	703247
(*C*)	439242	281951	870393	832188
(*D*)	387859	620310	652510	185210

Review Problems

1. How many pecks are there in $3\frac{3}{4}$ bushels?

2. How many tablespoonfuls are there in 48 teaspoonfuls?

3. What is the weight of $5\frac{1}{2}$ barrels of flour?

4. How many inches are there in $4\frac{5}{6}$ feet?

5. How many cubic feet are there in 4032 cubic inches?

6. How many pints are there in 8.25 quarts?

7. How many cupfuls are there in 96 teaspoonfuls?

8. How many quarts are there in 3.75 pecks?

Multiply each of the following numbers by 897:

	(1)	(2)	(3)	(4)	(5)	(6)
(*A*)	8954	9845	4859	6013	1630	3610
(*B*)	3789	2098	9280	9082	4678	3677
(*C*)	2576	3475	7342	7424	6572	1719

1. How many quarts are there in 5 pecks?

2. How many gallons will a cubic foot of space hold?

3. How many bushels of shelled corn are there in 1 ton of corn?

4. How many pounds are there in 8.04 tons?

5. How many square feet are there in an auditorium that is 20 yards long and 13 yards wide?

6. How many hours is it from 6 A.M. Monday to 6 P.M. Tuesday?

7. How many pints are there in 10 cupfuls?

8. $246 + 784 + 527 = ?$

9. How much is $\frac{3}{8}$ of 48.8 inches?

Divide each of the following numbers by 8:

	(1)	(2)	(3)	(4)	(5)	(6)
(*A*)	397168	703864	795436	554993	472654	313510
(*B*)	581671	508520	628983	304530	220195	379280
(*C*)	211450	202656	176402	563215	54736	918042

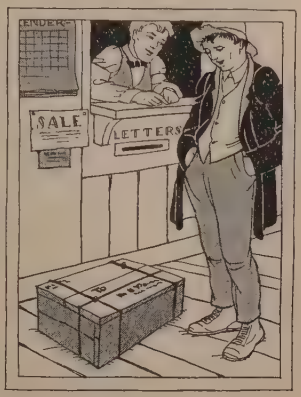
1. How many weeks are there from November 27 to Christmas?

2. What part of a year is 90 days?

3. How many days are there in $4\frac{2}{3}$ months?

4. How many miles and rods are there in 1800 rods?

5. Mr. Bone wishes to send a bushel of shelled pop corn to his brother for Christmas. Mr. Bone has a box which is 18 inches long, 12 inches wide, and 10 inches deep. Will this box hold a bushel of pop corn? Prove your answer.



6. How many months are there in 2.25 years?

Find the products:

	(1)	(2)	(3)	(4)	(5)
(*A*)	3478	3874	8347	4378	4387
	342	516	506	576	342
(*B*)	2299	6183	1799	8374	4597
	569	689	347	342	569
(*C*)	6489	8576	7377	4392	1799
	236	106	405	569	347

1. How many pounds and ounces are 30 ounces?

2. How many seconds are there in 1.75 minutes?

3. How many square inches are there in a blotter 2 feet long and 1.5 feet wide?

4. Which is greater, 1740 yards or 1 mile? How much greater?

5. How many feet are there in 400 yards?

6. How many miles and feet are there in 10000 feet?

7. Mr. Black owns a lot that is 25 yards wide and 50 yards deep. What part of an acre does the lot contain?

Divide each of these numbers by 7:

	(1)	(2)	(3)	(4)	(5)	(6)
(*A*)	690561	626214	415265	347647	208766	409173
(*B*)	333592	124075	183080	283790	483210	796518

Find the products:

1	2	3	4	5	6
6794	3288	6407	7066	6706	8562
146	457	507	567	308	405

7. How many weeks are there in $1\frac{1}{4}$ years?

8. How many gallons are there in 14 quarts?

9. How many cupfuls are there in 40 tablespoonfuls?

10. How many yards are there in 57 feet?

11. How many minutes are there in $1\frac{2}{3}$ hours?

12. Mr. Jackson has 25 full-sized bags of wheat in his wagon. Each bag contains about 150 pounds of wheat. How many bushels of wheat are there in Mr. Jackson's wagon?

13. How many pints are there in 1.28 quarts?

Find the products:

	(1)	(2)	(3)	(4)
(*A*)	8562	5166	7052	7254
	405	567	507	246

	(1)	(2)	(3)	(4)
(*B*)	2144	4942	4632	1236
	348	356	649	206
(*C*)	5027	9122	1229	2527
	679	459	308	308

Find the quotients when each of these numbers is divided by 6:

	(1)	(2)	(3)	(4)
(*A*)	535505	417455	234420	231738
(*B*)	172966	223450	408311	961260

1. How many cubic feet are there in $2\frac{1}{9}$ cubic yards?
2. How many acres are there in a field 20 rods square?
3. How many bushels of coal are there in 1 ton of coal?
4. How many bushels of oats are there in 1 ton of oats?

> A bushel of coal weighs 80 pounds.
> A bushel of oats weighs 32 pounds.

Long Division

Find the quotients:

	(1)	(2)	(3)
(*A*)	$196\overline{)1042132}$	$375\overline{)148500}$	$8333\overline{)702397}$
(*B*)	$640\overline{)5534080}$	$875\overline{)5411000}$	$5280\overline{)456940}$
(*C*)	$675\overline{)463725}$	$1728\overline{)3595104}$	$1875\overline{)890625}$

	(1)	(2)	(3)
(*D*)	$165\overline{)692835}$	$3025\overline{)26251375}$	$1666\overline{)900000}$
(*E*)	$320\overline{)330000}$	$1760\overline{)142546}$	$21504\overline{)209147904}$
(*F*)	$231\overline{)1822744}$	$1225\overline{)107625}$	$43560\overline{)33062040}$

1 bushel of wheat weighs 60 pounds.
1 bushel of coal weighs 80 pounds.
1 bushel of corn weighs 56 pounds.
1 barrel of flour weighs 196 pounds.
1 cubic yard equals 27 cubic feet.
1 pound equals 16 ounces.
1 minute equals 60 seconds.
1 gallon equals 8 pints.
1 peck equals 8 quarts.
1 mile equals 5280 feet.
1 square mile equals 640 acres.
1 cubic foot equals 1728 cubic inches.
1 ton equals 2000 pounds.
1 hour equals 3600 seconds.
1 quart equals 2 pints.
1 foot equals 12 inches.
1 square foot equals 144 square inches.
1 year equals 360 days.
1 day equals 24 hours.
1 acre equals 160 square rods.
1 month equals 30 days.

FRACTIONS

Using the numbers in the list on page 232, find the value of each of the following:

	(1)	(2)	(3)	(4)
(*A*)	$\frac{3}{5}$ bu. wheat	$\frac{3}{5}$ bu. coal	$\frac{7}{8}$ bu. corn	$\frac{3}{4}$ barrel flour
(*B*)	$\frac{7}{9}$ cu. yd.	$\frac{5}{8}$ lb.	$\frac{5}{6}$ min.	$\frac{3}{4}$ gal.
(*C*)	$\frac{3}{8}$ pk.	$\frac{1}{8}$ mi.	$\frac{3}{4}$ sq. mi.	$\frac{5}{9}$ cu. ft.
(*D*)	$\frac{3}{5}$ T.	$\frac{2}{5}$ hr.	$1\frac{1}{2}$ qt.	$\frac{3}{4}$ mo.

Find $\frac{2}{3}$ of each of the following:

(*E*)	1 ft.	1 sq. ft.	1 mi.	1 cu. ft.
(*F*)	1 min.	1 yr.	1 da.	1 cu. yd.

Find $\frac{3}{4}$ of each of the following:

(*G*)	1 pk.	1 ft.	1 mi.	1 A.
(*H*)	1 sq. mi.	1 cu. ft.	1 hr.	1 yr.

Find $\frac{4}{5}$ of each of the following:

(*I*)	1 mi.	1 A.	1 T.	1 min.

Find $\frac{2}{3}$ of each of the following:

	(1)	(2)	(3)
(*A*)	12 inches	5200 feet	160 square rods
(*B*)	27 cubic feet	24 gallons	50 bushels
(*C*)	60 days	$1.00	90 rods
(*D*)	900 pounds	72 cents	864 cubic inches

Find $\frac{3}{4}$ of each of the following:

(*E*)	12 inches	$1.00	600 miles
(*F*)	1728 cubic inches	640 acres	$8.12
(*G*)	60 days	1000 pounds	75 cents

Find $\frac{5}{6}$ of each of the following:

(*H*) $10.00	160 square rods	9000 pounds
(*I*) 180 days	$54.25	40 gallons
(*J*) 5200 feet	500 miles	75 cents

Find $\frac{7}{8}$ of each of the following:

(*K*) 360 days	200 acres	325 bushels
(*L*) 1760 yards	32 quarts	10,000 pounds
(*M*) 1728 cubic inches	$10.00	640 miles

Find the amounts of these bills:

1

$1\frac{1}{4}$ lb. figs at 30¢ a pound
2 bunches carrots at 5¢ each
$1\frac{1}{4}$ lb. tomatoes at 30¢ a pound
3 honey dew melons at 50¢ each
$2\frac{1}{2}$ lb. cookies at 35¢ a pound
2 baskets grapes at 55¢ each
3 loaves bread at 13¢ each
$1\frac{1}{3}$ dozen eggs at 46¢ per dozen
8 lb. sugar at $6\frac{1}{4}$¢ a pound
2 boxes pastry flour at 40¢ each
$\frac{1}{2}$ dozen oranges at $1.00 a dozen

2

3 qt. milk at 7¢ a quart
$1\frac{1}{2}$ lb. butter at 58¢ a pound
2 cans tuna fish at 35¢ each
$\frac{1}{2}$ pt. cream at 30¢ a pint
$1\frac{1}{2}$ qt. buttermilk at 6¢ a quart
2 loaves bread at 13¢ each
$\frac{1}{2}$ lb. prunes at 36¢ a pound
2 packages cereal at 15¢ each
$\frac{1}{2}$ dozen cakes soap at 5¢ a cake
$\frac{3}{4}$ dozen eggs at 56¢ a dozen
2 lb. sweet potatoes at 13¢ a pound

3

2 heads lettuce at 18¢ each
3 bunches carrots at 5¢ each
$\frac{1}{3}$ dozen pears at 50¢ a dozen
$\frac{1}{2}$ dozen cookies at 36¢ a dozen
3 baskets grapes at 55¢ each
4 grapefruit at 2 for 25¢
8 lb. sugar at 16 lb. for a dollar
$1\frac{1}{2}$ dozen oranges at 90¢ a dozen
$\frac{3}{4}$ lb. bananas at 40¢ a pound
$2\frac{1}{2}$ lb. rice at 12¢ a pound
1 lb. coffee at 55¢ a pound
2 loaves bread at 13¢ each
$\frac{1}{4}$ lb. shelled pecans at $1.20 a pound

4

2 loaves bread at 13¢ each
6 cans soup at 10¢ each
2 bunches celery at 23¢ each
1½ dozen eggs at 48¢ a dozen
3 lb. cabbage at 10¢ a pound
6 onions at 5¢ each
½ pk. green tomatoes at 30¢ a peck
½ pk. red tomatoes at 72¢ a peck
4 red peppers at 6¢ each
3 cans crab meat at 50¢ each

Find the cost of one article in each of the following cases:

1. When cans of asparagus are $3.65 a dozen.
2. When toy balloons are 19 cents a dozen.
3. When cans of stringless beans are $1.75 a dozen.
4. When cans of California cherries are $4.65 a dozen.
5. When eggs are 31 cents a dozen.
6. When hair nets are 42 cents a dozen.
7. When handkerchiefs are $1.40 a dozen.
8. When skirt hangers are 58 cents a dozen.
9. When milk bottles are 95 cents a dozen.
10. When linen napkins are $2.90 a dozen.
11. When jars of olives are $2.85 a dozen.

Multiply:

	(1)	(2)	(3)	(4)
(*A*)	1514	1817	1216	10504
	689	708	705	789
(*B*)	10903	10408	2306	8023
	568	346	132	304

Find the amounts of these bills:

1

$1\frac{1}{4}$ lb. figs at 20¢ a pound
2 boxes tapioca at 15¢ each
3 lb. brown sugar at $12\frac{1}{2}$¢ a pound
2 loaves bread at 13¢ each
3 lb. cabbage at 10¢ a pound
$1\frac{1}{2}$ dozen eggs at 48¢ a dozen
5 onions at 5¢ each
$1\frac{3}{4}$ lb. butter at 58¢ a pound

2

$\frac{1}{2}$ pt. cream at 30¢ a pint
3 loaves bread at 13¢ each
2 lb. grapes at $12\frac{1}{2}$¢ a pound
3 bunches celery at 10¢ bunch
1 bottle Chili sauce at 30¢
2 heads lettuce at 15¢ each
4 tomatoes at 5¢ each
2 cans tuna fish at 35¢ each
3 green peppers at $2\frac{1}{2}$¢ each

Change each of the following fractions to its lowest terms:

	(1)	(2)	(3)	(4)	(5)	(6)
(*A*)	$\frac{5}{10}$	$\frac{4}{6}$	$\frac{6}{8}$	$\frac{3}{6}$	$\frac{2}{8}$	$\frac{2}{6}$
(*B*)	$\frac{4}{8}$	$\frac{6}{9}$	$\frac{2}{10}$	$\frac{3}{9}$	$\frac{14}{16}$	$\frac{4}{10}$
(*C*)	$\frac{3}{12}$	$\frac{8}{10}$	$\frac{7}{14}$	$\frac{4}{12}$	$\frac{2}{14}$	$\frac{4}{16}$
(*D*)	$\frac{8}{12}$	$\frac{6}{16}$	$\frac{9}{12}$	$\frac{8}{16}$	$\frac{10}{12}$	$\frac{10}{16}$
(*E*)	$\frac{6}{12}$	$\frac{12}{16}$	$\frac{6}{10}$	$\frac{2}{16}$	$\frac{2}{12}$	$\frac{10}{15}$

Find the amounts of these bills:

1

$1\frac{1}{2}$ lb. butter at 59¢ a pound
2 qt. buttermilk at 6¢ a pint
$\frac{1}{2}$ pt. cream at 30¢ a pint
2 loaves bread at 13¢ each
$\frac{1}{4}$ lb. prunes at 36¢ a pound
2 lb. brown sugar at $12\frac{1}{2}$¢ a pound
$1\frac{1}{4}$ dozen eggs at 55¢ a dozen
2 packages bran at 15¢ each
6 bars soap at 5¢ each

2

2 pt. milk at 6¢ a pint
$\frac{3}{4}$ dozen eggs at 48¢ a dozen
2 loaves bread at 13¢ each
2 heads cauliflower at 40¢ each
3 cans shrimp at 23¢ each
16 lb. sugar at $6\frac{1}{4}$¢ a pound
$\frac{1}{2}$ lb. cheese at 50¢ a pound
2 bunches celery at 10¢ a bunch

Changing Improper Fractions to Mixed Numbers

In doing the next examples do not use your paper and pencil unless you have to. Do not write in your book.

Change these fractions to mixed numbers:

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
(A)	$\frac{13}{7}$	$\frac{17}{9}$	$\frac{13}{8}$	$\frac{11}{6}$	$\frac{31}{16}$	$\frac{25}{16}$	$\frac{21}{16}$	$\frac{23}{16}$
(B)	$\frac{11}{9}$	$\frac{15}{8}$	$\frac{11}{7}$	$\frac{16}{9}$	$\frac{30}{16}$	$\frac{20}{12}$	$\frac{20}{16}$	$\frac{10}{6}$
(C)	$\frac{12}{7}$	$\frac{11}{8}$	$\frac{13}{9}$	$\frac{10}{7}$	$\frac{12}{8}$	$\frac{12}{9}$	$\frac{21}{12}$	$\frac{24}{16}$
(D)	$\frac{10}{9}$	$\frac{14}{9}$	$\frac{29}{16}$	$\frac{19}{12}$	$\frac{10}{8}$	$\frac{15}{9}$	$\frac{14}{8}$	$\frac{22}{16}$

Changing Mixed Numbers to Improper Fractions

	(1)	(2)	(3)	(4)	(5)
(A)	$1\frac{2}{4} = ?$	$1\frac{2}{7} = ?$	$1\frac{1}{3} = ?$	$1\frac{3}{5} = ?$	$1\frac{1}{8} = ?$
(B)	$1\frac{13}{16} = ?$	$1\frac{1}{4} = ?$	$1\frac{1}{6} = ?$	$1\frac{1}{12} = ?$	$1\frac{2}{5} = ?$
(C)	$1\frac{1}{7} = ?$	$1\frac{5}{12} = ?$	$1\frac{1}{5} = ?$	$1\frac{1}{16} = ?$	$1\frac{3}{16} = ?$

Find the amounts of these bills:

1

2 qt. milk at 10¢ a quart
3 heads lettuce at 18¢ each
4 cans tuna fish at $12\frac{1}{2}$¢ each
5 loaves bread at 13¢ each
3 lb. sweet potatoes at $12\frac{1}{2}$¢ a pound
$1\frac{1}{2}$ lb. butter at 59¢ a pound

2

2 cans tuna fish at 35¢ a can
$\frac{1}{2}$ pt. cream at 30¢ a pint
2 qt. buttermilk at 6¢ a quart
$2\frac{1}{2}$ lb. grapes at 14¢ a pound
$1\frac{1}{2}$ lb. rice at 12¢ a pound
2 loaves bread at 13¢ each
$1\frac{1}{2}$ qt. olive oil at 90¢ a quart
3 pk. potatoes at 58¢ a peck
4 bunches celery at 2 for 15¢
8 oranges at 90¢ a dozen
$\frac{1}{2}$ lb. prunes at 36¢ a pound

Change the following fractions to mixed numbers or whole numbers:

	(1)	(2)	(3)	(4)
(*A*)	$\frac{4}{2}$	$\frac{23}{8}$	$\frac{6}{3}$	$\frac{18}{8}$
(*B*)	$\frac{5}{2}$	$\frac{16}{8}$	$\frac{8}{3}$	$\frac{17}{6}$
(*C*)	$\frac{22}{8}$	$\frac{7}{3}$	$\frac{10}{5}$	$\frac{17}{8}$
(*D*)	$\frac{8}{4}$	$\frac{20}{8}$	$\frac{12}{6}$	$\frac{11}{4}$
(*E*)	$\frac{21}{8}$	$\frac{10}{4}$	$\frac{14}{5}$	$\frac{15}{6}$
(*F*)	$\frac{19}{8}$	$\frac{11}{5}$	$\frac{16}{6}$	$\frac{12}{5}$
(*G*)	$\frac{13}{6}$	$\frac{13}{5}$	$\frac{9}{4}$	$\frac{14}{6}$

Change these mixed numbers to improper fractions:

	(1)	(2)	(3)	(4)	(5)
(*A*)	$1\frac{3}{7}$	$1\frac{6}{8}$	$1\frac{9}{16}$	$1\frac{4}{7}$	$1\frac{5}{9}$
(*B*)	$1\frac{7}{16}$	$1\frac{1}{9}$	$1\frac{3}{8}$	$1\frac{7}{9}$	$1\frac{5}{16}$
(*C*)	$1\frac{2}{9}$	$1\frac{4}{6}$	$1\frac{4}{9}$	$1\frac{5}{7}$	$1\frac{6}{9}$

1. How many yards are there in 7.285 feet?
2. Change $\frac{2}{7}$ to a decimal fraction.
3. Change $\frac{1}{16}$ to a decimal fraction.

Give the answers to the next examples without using pencil and paper.

Subtract in each of the following examples:

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
(*A*)	1	1	1	1	1	1	1	1
	$\frac{3}{4}$	$\frac{1}{16}$	$\frac{1}{2}$	$\frac{1}{9}$	$\frac{15}{16}$	$\frac{1}{3}$	$\frac{11}{12}$	$\frac{2}{3}$
(*B*)	1	1	1	1	1	1	1	1
	$\frac{13}{16}$	$\frac{1}{4}$	$\frac{7}{12}$	$\frac{1}{5}$	$\frac{5}{16}$	$\frac{11}{16}$	$\frac{3}{5}$	$\frac{4}{9}$

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
(*C*)	$1\frac{3}{16}$	$1\frac{1}{7}$	$1\frac{2}{5}$	$1\frac{5}{12}$	$1\frac{6}{7}$	$1\frac{4}{5}$	$1\frac{1}{12}$	$1\frac{1}{6}$
(*D*)	$1\frac{4}{7}$	$1\frac{8}{9}$	$1\frac{5}{6}$	$1\frac{1}{8}$	$1\frac{2}{9}$	$1\frac{5}{7}$	$1\frac{7}{8}$	$1\frac{2}{7}$
(*E*)	$1\frac{5}{9}$	$1\frac{3}{8}$	$1\frac{9}{16}$	$1\frac{3}{7}$	$1\frac{5}{8}$	$1\frac{7}{16}$	$1\frac{7}{9}$	$1\frac{3}{13}$

Two-Step Problems

1. What is the cost of 6 boxes of strawberries at 2 boxes for 25 cents?

2. A merchant bought a shipment of umbrellas for $125 and sold them at 15 per cent profit. How much did he get for them?

3. Grace Ingalls has the following grades this month: reading 85, arithmetic 80, spelling 94, composition 90, geography 95, history 92, penmanship 75. What is her average for the month?

4. James Roberts bought 4 shirts for $1.48 each. He paid for them with a 10-dollar bill. How much change should he receive?

5. William Murphy bought a bicycle for $25.00 and sold it at $\frac{1}{5}$ off. How much did he get for the bicycle?

6. One and a half gallons are how many quarts?

7. Mary Wilson bought a tablet for 7 cents, a book for 56 cents, and a pencil for 5 cents. She paid with a 2-dollar bill. How much change should she receive?

8. How long is it from 7 A.M. to 3:30 P.M.?

9. Ernest Ball earned $16.00 last week. He spent $12.00 and saved the rest. What per cent of his week's wages did he save?

10. Baseball shoes sell at $3.50 per pair. Suits with caps sell for $8.50 each. What will it cost to equip a team of 9 players with suits, caps, and shoes?

11. Mary Grimes has a box of candy that weighs 1 pound and 10 ounces. John Grimes has a box of candy that weighs 25 ounces. Which child has more ounces of candy? How much more?

12. Mary's mother bought 27 inches of pongee from a piece that was $12\frac{2}{3}$ feet long. How many yards of pongee were left in the piece?

"What Part Of" and "How Many Times" Exercises

In "what part of" exercises, you remember that you write the *larger* number as the denominator and the smaller number as the numerator. Reduce the fraction to its lowest terms when necessary.

In "how many times" exercises, write the *smaller* number as the denominator and the larger one as the numerator. Reduce the fraction to a mixed number. Reduce the fraction of the mixed number to its lowest terms, if necessary.

1. 25 is what part of 100?
2. 51 is how many times 15?
3. 80 is what part of 100?
4. 219 is how many times 36?

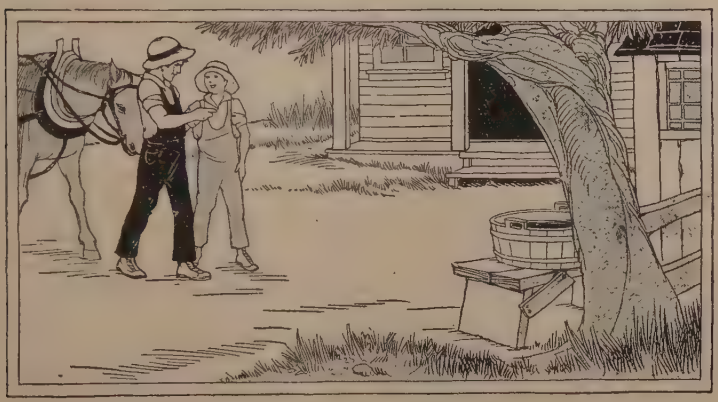
5. 279 is how many times 144?

6. 72 is what part of 144?

7. 22 is what part of 32?

8. One hundred eight cubic inches are what part of a cubic foot?

9. How long will 167 ounces of milk last Baby Elizabeth if she drinks 2.08 pounds of milk every day?



10. Harry and his father have 48 acres of land to plow. They have finished 27 acres. What part of their work is already done?

11. Fred and his mother were driving to meet Fred's father, who was 80 miles away. They went 25 miles in the first hour. What part of the whole distance did they go?

12. A field containing 40 acres is how many times as large as one containing 32 acres?

13. Eighty-nine ounces are how many pounds?

14. A railway bridge across a river is 2310 feet long. What part of a mile are 2310 feet?

15. Twenty-seven acres are how many times 16 acres?

16. Fifty-two dollars are what part of $64.00?

17. Thirty quarts are what part of a bushel?

Exercises with Fractions

Find the cost of each of the following items:

1. $3\frac{3}{4}$ lb. of apricots at 25¢ a pound.
2. $2\frac{2}{3}$ dozen cans of asparagus at $3.65 a dozen.
3. $8\frac{1}{2}$ yd. of awning cloth at 34¢ a yard.
4. $3\frac{1}{3}$ dozen toy balloons at 19¢ a dozen.
5. $3\frac{3}{4}$ yd. of batiste at 27¢ a yard.
6. 400 beads at $6\frac{1}{2}$¢ a hundred.
7. $3\frac{3}{4}$ lb. of beefsteak at 38¢ a pound.
8. $6\frac{2}{3}$ lb. of beef roast at 17¢ a pound.
9. $2\frac{1}{2}$ dozen cans of stringless beans at $1.75 a dozen.
10. 275 bolts at 58¢ a hundred.
11. $\frac{3}{4}$ lb. of Bordeaux mixture at 33¢ a pound.
12. 2500 bricks at $15.00 per thousand.
13. $10\frac{2}{3}$ yd. of braid at 40¢ a yard.
14. $4\frac{3}{8}$ lb. of butter at 43¢ a pound.
15. $5\frac{3}{4}$ dozen buttons at 25¢ a dozen.
16. $3\frac{5}{8}$ yd. of calico at 15¢ a yard.
17. $4\frac{3}{8}$ yd. of chiffon at $1.98 a yard.
18. $4\frac{3}{4}$ lb. of coffee at 55¢ a pound.

19. $3\frac{3}{8}$ yd. of crepe de chine at \$1.10 per yard.

20. $4\frac{1}{2}$ yd. of denim at 20¢ a yard.

21. $2\frac{3}{4}$ T. of coal at \$17.50 a ton.

Find the sums of the following mixed numbers:

(1)	(2)	(3)	(4)
$17\frac{3}{4}$	$8\frac{4}{5}$	$16\frac{2}{3}$	$6\frac{9}{16}$
$2\frac{3}{4}$	$6\frac{2}{5}$	$66\frac{2}{3}$	$10\frac{13}{16}$

Find the differences:

	(1)	(2)	(3)	(4)
(*A*)	$33\frac{1}{3}$	$9\frac{1}{4}$	$40\frac{1}{8}$	$19\frac{1}{16}$
	$10\frac{2}{3}$	$6\frac{3}{4}$	$33\frac{7}{8}$	$9\frac{13}{16}$
(*B*)	$87\frac{5}{12}$	$10\frac{2}{5}$	$14\frac{5}{16}$	$16\frac{3}{8}$
	$27\frac{11}{12}$	$9\frac{4}{5}$	$12\frac{9}{16}$	$3\frac{5}{8}$
(*C*)	$22\frac{1}{7}$	$11\frac{1}{9}$	$7\frac{1}{3}$	$10\frac{3}{5}$
	$15\frac{6}{7}$	$5\frac{4}{9}$	$2\frac{2}{3}$	$8\frac{4}{5}$

Review Problems

1. What per cent of \$26.00 is \$14.00?

2. Sixty quarts are how many bushels?

3. A farm containing 120 acres is what per cent of a square mile?

4. Ten pints are how many gallons?

5. Ten ounces are what per cent of a pound?

6. Seventeen inches are how many feet?

7. How many boards 3 feet long can be cut from a board 105 inches long? What per cent of a yard will be left over?

8. Twelve quarts are what per cent of a bushel?

9. Thirty-one inches are how many feet?

10. One hundred forty square rods are what per cent of an acre?

11. Thirty-eight ounces equal how many pounds?

12. Eighty-four square inches are what per cent of a square foot?

13. Twenty-one pints equal how many gallons?

14. Thirty-three eggs are what per cent of 3 dozen eggs?

15. Fifty-eight quarts equal how many bushels?

Find the sums:

	(1)	(2)	(3)	(4)
(*A*)	$7\frac{5}{12}$	$7\frac{5}{8}$	$62\frac{5}{6}$	$4\frac{3}{7}$
	$9\frac{11}{12}$	$8\frac{3}{8}$	$18\frac{5}{6}$	$9\frac{5}{7}$
(*B*)	$10\frac{3}{5}$	$20\frac{1}{3}$	$17\frac{5}{16}$	$10\frac{3}{4}$
	$12\frac{3}{5}$	$6\frac{2}{3}$	$12\frac{11}{16}$	$9\frac{1}{4}$

Find the products:

	(1)	(2)	(3)	(4)
(*A*)	16	$10\frac{1}{2}$	18	$16\frac{3}{4}$
	$3\frac{5}{8}$	4	$1\frac{7}{9}$	20
(*B*)	$16\frac{2}{3}$	$37\frac{1}{2}$	240	1500
	6	8	$33\frac{1}{3}$	$66\frac{2}{3}$

Special Subtraction

Study the two examples which are worked out:

Examples

(*A*)	(*B*)
$16\frac{2}{3}$	16
8	$8\frac{2}{3}$
$8\frac{2}{3}$	$7\frac{1}{3}$

They are not alike. When the fraction is with the top number, the example is easy. When it is with the bottom number, this is not quite true. Some of the following examples are like (*A*) and some are like (*B*). Watch closely and be sure that you know which type each example is before you try to work it.

Find the differences:

	(1)	(2)	(3)	(4)	(5)
(*A*)	100	$75\frac{1}{2}$	75	18	25
	$48\frac{3}{4}$	37	$33\frac{1}{3}$	$6\frac{3}{4}$	$19\frac{3}{4}$
(*B*)	$15\frac{3}{5}$	25	50	100	100
	5	$5\frac{1}{4}$	$16\frac{2}{3}$	$18\frac{3}{4}$	$66\frac{2}{3}$
(*C*)	$100\frac{5}{6}$	100	$62\frac{1}{2}$	100	100
	75	$87\frac{1}{2}$	37	$33\frac{1}{3}$	$16\frac{2}{3}$

CHAPTER VII

FRACTIONS AND MIXED NUMBERS WITH UNLIKE DENOMINATORS

Learn these facts if you do not already know them:

$\frac{1}{2} = \frac{2}{4}$
$\frac{1}{2} = \frac{4}{8}$
$\frac{1}{2} = \frac{6}{12}$
$\frac{1}{2} = \frac{8}{16}$
$\frac{1}{2} = \frac{3}{6}$
$\frac{1}{3} = \frac{4}{12}$
$\frac{1}{3} = \frac{2}{6}$
$\frac{1}{3} = \frac{3}{9}$
$\frac{2}{3} = \frac{6}{9}$
$\frac{2}{3} = \frac{8}{12}$
$\frac{2}{3} = \frac{4}{6}$
$\frac{1}{4} = \frac{2}{8}$
$\frac{1}{4} = \frac{3}{12}$
$\frac{1}{4} = \frac{4}{16}$
$\frac{3}{4} = \frac{6}{8}$
$\frac{3}{4} = \frac{9}{12}$
$\frac{3}{4} = \frac{12}{16}$
$\frac{1}{6} = \frac{2}{12}$
$\frac{5}{6} = \frac{10}{12}$
$\frac{1}{8} = \frac{2}{16}$
$\frac{3}{8} = \frac{6}{16}$
$\frac{5}{8} = \frac{10}{16}$
$\frac{7}{8} = \frac{14}{16}$

Adding Fractions with Unlike Denominators

Sometimes we have to add and subtract fractions and mixed numbers whose denominators are not the same. This is the case in an example like

Example (*A*). Find the sum of $\frac{1}{4}$ and $\frac{1}{2}$.

Now we cannot add $\frac{1}{4}$ and $\frac{1}{2}$ as they stand, because that would be like trying to add one foot to one hour. We cannot add one foot and one hour, because we cannot change either one into the other. But we can change one of these fractions into a fraction like the other. You have

learned that $\frac{1}{2} = \frac{2}{4}$. This is always true; so we change $\frac{1}{2}$ into $\frac{2}{4}$ and get $\frac{3}{4}$ as our answer.

The following examples are like the one you have just done. Remember that one of the fractions will have to be changed before you add. We always change the one that has the smaller denominator. Change your answers to their best forms.

Find the sums:

	(1)	(2)	(3)	(4)
(A)	$\frac{1}{2}$ $\frac{1}{8}$	$\frac{1}{2}$ $\frac{1}{6}$	$\frac{1}{2}$ $\frac{3}{4}$	$\frac{1}{2}$ $\frac{1}{12}$
(B)	$\frac{7}{16}$ $\frac{1}{8}$	$\frac{1}{6}$ $\frac{5}{12}$	$\frac{1}{4}$ $\frac{1}{8}$	$\frac{1}{4}$ $\frac{1}{2}$
(C)	$\frac{1}{2}$ $\frac{7}{8}$	$\frac{1}{3}$ $\frac{1}{6}$	$\frac{1}{4}$ $\frac{11}{12}$	$\frac{11}{16}$ $\frac{1}{4}$
(D)	$\frac{5}{6}$ $\frac{1}{2}$	$\frac{7}{8}$ $\frac{1}{4}$	$\frac{15}{16}$ $\frac{1}{8}$	$\frac{11}{16}$ $\frac{1}{2}$
(E)	$\frac{1}{4}$ $\frac{11}{12}$	$\frac{1}{3}$ $\frac{5}{12}$	$\frac{1}{4}$ $\frac{13}{16}$	$\frac{1}{3}$ $\frac{7}{9}$
(F)	$\frac{7}{12}$ $\frac{1}{4}$	$\frac{5}{6}$ $\frac{1}{3}$	$\frac{1}{3}$ $\frac{5}{9}$	$\frac{1}{6}$ $\frac{7}{12}$

In the examples given just above, each fraction to be changed has 1 for its numerator. Sometimes we need to change a fraction which has more than 1 for its numerator.

Example (*B*). Add $\frac{3}{4}$ and $\frac{5}{8}$.

$$\frac{3}{4} = \frac{6}{8}$$
$$\frac{5}{8} = \frac{5}{8}$$
$$\frac{11}{8} = 1\frac{3}{8}$$

We change $\frac{3}{4}$ to $\frac{6}{8}$ and add that to $\frac{5}{8}$, getting $\frac{11}{8}$, or $1\frac{3}{8}$, for our answer.

Add the following fractions:

	(1)	(2)	(3)	(4)
(*A*)	$\frac{3}{4}$	$\frac{5}{6}$	$\frac{2}{3}$	$\frac{2}{3}$
	$\frac{7}{12}$	$\frac{11}{12}$	$\frac{8}{9}$	$\frac{1}{6}$
(*B*)	$\frac{3}{4}$	$\frac{3}{4}$	$\frac{7}{8}$	$\frac{5}{6}$
	$\frac{1}{16}$	$\frac{1}{8}$	$\frac{3}{16}$	$\frac{1}{12}$
(*C*)	$\frac{2}{3}$	$\frac{3}{8}$	$\frac{2}{3}$	$\frac{3}{4}$
	$\frac{7}{12}$	$\frac{3}{16}$	$\frac{2}{9}$	$\frac{3}{8}$
(*D*)	$\frac{5}{8}$	$\frac{5}{6}$	$\frac{1}{4}$	$\frac{2}{3}$
	$\frac{5}{16}$	$\frac{5}{12}$	$\frac{11}{12}$	$\frac{11}{12}$

What are the differences?

1	2	3	4	5
\$94.02	\$11.21	\$13.32	\$9.20	\$16.78
26.23	5.54	9.89	4.31	9.11

6. Mr. Townsend sold apples to four families, as follows: to family A, 10 bushels; to family B, 15 bushels; to family C, 25 bushels; to family D, 4 bushels. What was the average number of bushels sold to each family?

Once in a while we need to add as in this example:

Example (*C*). Add $\frac{1}{2}$ and $\frac{1}{3}$.

$$\frac{1}{2} = \frac{3}{6}$$
$$\frac{1}{3} = \frac{2}{6}$$
$$\frac{5}{6}$$

We cannot add halves and thirds, because they are not alike. Moreover we cannot change one of these into the other. But we can change both of them into something else which we can add. We have learned that $\frac{1}{2} = \frac{3}{6}$ and $\frac{1}{3} = \frac{2}{6}$. We can change $\frac{1}{2}$ and $\frac{1}{3}$ into $\frac{3}{6}$ and $\frac{2}{6}$ and obtain $\frac{5}{6}$, which is the answer. Heretofore we have changed the fraction with the smaller denominator into a fraction like the one with the larger denominator. Where this cannot be done we multiply the two denominators together for

---

1. Jane Sanford is 18 years old. Her sister Alice is 12. How much older is Jane than Alice?

2. Change $\frac{3}{4}$ to a decimal.

When goods are put on sale, the original price is the **list price.** The selling price is the **net price,** and the amount taken off is the **discount.**

3. The list price on a pair of shoes was \$6.00. The discount was \$2.50. What was the net price?

4. What is the amount of the discount on a bill for \$50.00 when the goods are sold at 25 per cent off?

5. Mary Robinson bought these goods for her mother: 2 pounds of sugar at $6\frac{1}{2}¢$ per pound; 5 yards of elastic at 15¢ a yard; 10 buttons at 2 for 5¢; 4 hair nets at 2 for 25¢. Mary had a 5-dollar bill that her mother gave her for these goods. How much change did Mary bring home with her?

a new denominator. Then we can always change both fractions to that denominator.

Find the sums:

	(1)	(2)	(3)	(4)	(5)
(A)	$\frac{1}{2}$	$\frac{1}{3}$	$\frac{1}{4}$	$\frac{2}{3}$	$\frac{1}{4}$
	$\frac{2}{3}$	$\frac{1}{4}$	$\frac{2}{3}$	$\frac{3}{4}$	$\frac{7}{9}$
(B)	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{6}$	$\frac{5}{6}$	$\frac{1}{6}$
	$\frac{1}{7}$	$\frac{1}{9}$	$\frac{1}{4}$	$\frac{3}{4}$	$\frac{3}{4}$

Do you see that in the last three examples we can change both fractions to something with a denominator less than 24? What else could we have used for a denominator?

Adding Mixed Numbers with Unlike Denominators

Example. What is the sum of $2\frac{1}{2}$ and $5\frac{7}{8}$?

$$2\tfrac{1}{2} \qquad \tfrac{1}{2} = \tfrac{4}{8}$$
$$5\tfrac{7}{8} \qquad \tfrac{7}{8} = \tfrac{7}{8}$$
$$8\tfrac{3}{8} \qquad \tfrac{11}{8} = 1\tfrac{3}{8}$$

What are the sums of the following columns?

1	2	3	4	5
140	5340	4512	9793	8982
9299	9498	8372	1407	2330
8589	8905	2299	8157	4169
4607	3070	2734	7110	4372
4451	4289	7067	1995	1186
5309	1213	1833	5974	5825
3640	2334	2645	2944	8717
1864	3301	1022	1009	3424

Since $\frac{1}{2}$ equals $\frac{4}{8}$, we write $\frac{1}{2} = \frac{4}{8}$; $\frac{7}{8}$ and $\frac{4}{8}$ are $\frac{11}{8}$, which equals $1\frac{3}{8}$. We write down the $\frac{3}{8}$ and add the 1 in with the other whole numbers. In adding mixed numbers we always add the fractions first. Then if the sum is a mixed number, we write down the fraction and carry the rest to the ones' column. Do the following examples in the same way.

Find the sums:

	(1)	(2)	(3)	(4)	(5)
(*A*)	$24\frac{3}{4}$	$3\frac{1}{6}$	$10\frac{1}{16}$	$9\frac{7}{12}$	$8\frac{1}{3}$
	$18\frac{1}{2}$	$16\frac{2}{3}$	$5\frac{1}{4}$	$5\frac{3}{4}$	$5\frac{5}{6}$
(*B*)	$66\frac{2}{3}$	$18\frac{3}{4}$	$3\frac{5}{8}$	$12\frac{1}{2}$	$20\frac{1}{4}$
	$25\frac{1}{4}$	$5\frac{1}{6}$	$15\frac{1}{2}$	$8\frac{1}{3}$	$40\frac{2}{3}$

Problems in Addition of Mixed Numbers

1. Harry Smith has been picking berries with his little sister Alice. Harry picked $5\frac{3}{4}$ quarts and Alice picked $4\frac{1}{2}$ quarts. How many quarts have both the children picked together?

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1. What is the area of a flower garden 25 feet long and 15 feet wide?

2. During a basketball season the total number of games that have been played is often thought of as 100 per cent. We lost $33\frac{1}{3}$ per cent of our games last year and won the rest of them. What per cent of our games did we win?

3. Mr. Walton paid $585 for a number of lamps to sell from his store. The lamps cost $9.00 each. How many lamps did Mr. Walton buy?

2. John Adams weighs $75\frac{3}{8}$ pounds. Arthur Jones weighs $67\frac{1}{2}$ pounds. How much do both boys together weigh?

3. Frank Carter has been buying lumber for a stairway which he plans to build in his father's barn. He found some boards of different lengths for sale at reduced prices. He bought boards as follows:

4 boards, each $10\frac{5}{6}$ feet long
3 boards, each $8\frac{3}{4}$ feet long
5 boards, each $5\frac{2}{3}$ feet long

How many feet of board did he buy in all?

4. Jane Abbott has been buying ribbon at the remnant counter. She bought one piece $3\frac{5}{6}$ yards long, one $8\frac{1}{3}$ yards long, and one $6\frac{3}{4}$ yards long. How many yards of ribbon did she buy in all?

5. William Fisher earns his spending money by doing odd jobs for the neighbors. This is his record for last week:

Monday: Mowing lawns	$2\frac{3}{4}$ hours
Tuesday: Working in the garden	$1\frac{5}{6}$ hours
Wednesday: Picking cherries	$1\frac{2}{3}$ hours
Thursday: Painting fence	$3\frac{1}{2}$ hours
Friday: Going errands	$1\frac{1}{4}$ hours
Saturday: Cleaning sidewalks	$\frac{2}{3}$ hour

How many hours did William work last week?

---

1. What is .2 of 68.4 feet?

2. Ralph Maxwell weighed $65\frac{3}{4}$ pounds last year. This year he weighs $87\frac{1}{4}$ pounds. How many pounds has Ralph gained during the year?

3. 7648 is how many times 8?

4. What per cent of 40 miles are 20 miles?

6. Mr. Turner hauls coal. On Thursday he hauled five loads which weighed as follows: first load, $2\frac{1}{4}$ tons; second load, $1\frac{3}{4}$ tons; third load, $2\frac{1}{8}$ tons; fourth load, $1\frac{1}{2}$ tons; fifth load, $1\frac{7}{8}$ tons. How many tons did he haul in all?

7. The ladies of our church are going to have a dinner on election day. They need 5 bushels of apples. Farmer Brown offered to give them all the apples which were piled on the ground in his orchard if they would come and get them. Arthur Jones went after the apples in his truck. He found them in three piles. The first pile had $1\frac{3}{4}$ bushels in it, the second $1\frac{1}{2}$ bushels, and the third $1\frac{7}{8}$ bushels. Did he get as many apples as the ladies needed? Prove your answer.

8. Father is going to buy a new fence for our barn lot. There is a large gate on the south side and a large gate on

---

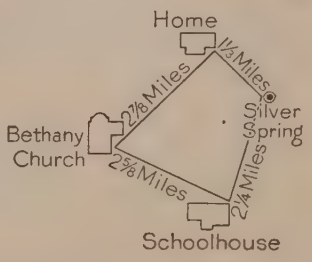
Find the products:

1	2	3	4	5
843.2	9750	9.84	7610	68.521
346	97.6	.25	.054	1.7

6. John Markham rode his bicyle from his home to the home of his grandmother. The distance is just 10.8 miles. If John averaged 9 miles per hour, how long did it take him to get to his grandmother's home?

7. Jack Brink kept a record of his time as he walked to school. This is his record: Monday, $\frac{1}{2}$ hour; Tuesday, 45 minutes; Wednesday, $\frac{2}{3}$ hour; Thursday, 40 minutes; Friday, $\frac{3}{4}$ hour. What was his average time in minutes? What part of an hour is that?

the east side. There is a small gate on the west side. Father measured each side, allowing for the gates. This is what he got: north side, $20\frac{3}{4}$ yards; east side, $22\frac{1}{3}$ yards; south side, $17\frac{3}{4}$ yards; and west side, $24\frac{1}{3}$ yards. How many yards of fence will he need?



9. Mary and her sister Alice rode their bicycles from home to Silver Spring, then to the schoolhouse, then to the church, then home again by the short road. How far did they ride in all?

Subtracting Fractions with Unlike Denominators

In using fractions we often need to know which is more and how much more. We find how much more by subtraction. This is sometimes called finding the difference.

Example. Which is more, $\frac{1}{2}$ or $\frac{3}{4}$? How much more?

1. Three children, Ann, James, and John, guessed at the distance from the public square to the circus grounds. Ann guessed $2\frac{1}{2}$ miles; James guessed $1\frac{1}{2}$ miles; John guessed 2 miles. The actual distance is 3 miles. How much did each child lack of getting the distance right?

2. What part of 12 inches is 9 inches?

3. Divide 4011 by 4. Extend your answer to two decimal places.

4. What per cent of 3000 is 8000?

5. What is the cost of 18 dozen linen napkins at $9.75 a dozen?

We cannot tell which is more and how much more with these fractions, as they are not alike; so we change the $\frac{1}{2}$ to fourths: $\frac{1}{2} = \frac{2}{4}$. Now our question reads "Which is more, $\frac{2}{4}$ or $\frac{3}{4}$?" and we know at once that $\frac{3}{4}$ is more than $\frac{2}{4}$. We write the larger fraction on top, thus: $\frac{\frac{3}{4}}{\frac{2}{4}}$. Subtracting, we get $\frac{1}{4}$. That is $\frac{3}{4}$ is $\frac{1}{4}$ more than $\frac{1}{2}$. Prove this by cutting an apple into four equal parts.

1. Which is more, $\frac{1}{3}$ or $\frac{1}{6}$? How much more?
2. Which is more, $\frac{1}{8}$ or $\frac{1}{4}$? How much more?
3. Which is more, $\frac{1}{8}$ or $\frac{1}{16}$? How much more?
4. Which is more, $\frac{3}{4}$ or $\frac{13}{16}$? How much more?
5. Which is more, $\frac{2}{5}$ or $\frac{5}{6}$? How much more?
6. Which is more, $\frac{7}{8}$ or $\frac{3}{4}$? How much more?
7. Which is more, $\frac{2}{3}$ or $\frac{5}{9}$? How much more?

Find the quotients:

	(1)	(2)	(3)	(4)
(*A*)	$7\overline{)1.3146}$	$7\overline{)204.47}$	$9\overline{)532.08}$	$4\overline{)40811.2}$
(*B*)	$8\overline{)55.0314}$	$9\overline{)7.02}$	$8\overline{)1005.53}$	$7\overline{)28.035}$

1. What per cent means the same as $\frac{1}{4}$?
2. Find the total cost of these items:

1 magazine	\$ .35
1 tennis racket	8.75
1 pair tennis shoes	1.78
Car fare	.28
1 book	1.28
Total	

8. Which is more, $\frac{5}{16}$ or $\frac{3}{8}$? How much more?

9. Which is more, $\frac{7}{8}$ or $\frac{13}{16}$? How much more?

10. Which is more, $\frac{2}{3}$ or $\frac{7}{12}$? How much more?

Sometimes we cannot change either fraction into one of the same kind as the other. Then we have to change them both. You can always get a new denominator by multiplying the two denominators that are given. Sometimes you will see a method shorter than this. Use the smallest new denominator that you can. Which is more, $\frac{2}{3}$ or $\frac{3}{4}$? How much more? There is no way to change $\frac{2}{3}$ to fourths or $\frac{3}{4}$ to thirds, so we multiply the two denominators and get 12. We can change both $\frac{2}{3}$ and $\frac{3}{4}$ to twelfths. We have learned that $\frac{2}{3} = \frac{8}{12}$ and that $\frac{3}{4} = \frac{9}{12}$. We know that $\frac{9}{12}$ is more than $\frac{8}{12}$, and so $\frac{3}{4}$ is more than $\frac{2}{3}$. We find how much more by subtracting $\frac{8}{12}$ from $\frac{9}{12}$, getting $\frac{1}{12}$, which is the correct answer. Hence, $\frac{3}{4}$ is $\frac{1}{12}$ more than $\frac{2}{3}$. Can you prove this with 12 small pasteboard squares?

1. Which is more, $\frac{1}{2}$ or $\frac{1}{3}$? How much more?

2. Which is more, $\frac{1}{4}$ or $\frac{1}{3}$? How much more?

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1. Mrs. Carter bought $6\frac{2}{3}$ yards of challie for curtains. If she uses 4 feet of material for each curtain, how many curtains can she make from $6\frac{2}{3}$ yards of challie?

2. Fred Alsop had \$89.70. He spent \$34.26 for a bicycle. What per cent of \$89.70 did Fred have left?

3. John Baker's father offered him 20 per cent commission on all the berries that he picked. He picked 100 quarts of berries and sold them at $12\frac{1}{2}$ cents a quart. What amount of money should John keep for himself?

3. Which is more, $\frac{1}{6}$ or $\frac{1}{8}$? How much more?

4. Which is more, $\frac{1}{4}$ or $\frac{1}{6}$? How much more?

5. Which is more, $\frac{1}{2}$ or $\frac{2}{3}$? How much more?

6. Which is more, $\frac{1}{2}$ or $\frac{4}{9}$? How much more?

Practice Exercises

Find the quotient:

	(1)	(2)	(3)	(4)
(*A*)	$6\overline{)2160.42}$	$7\overline{)496.0053}$	$9\overline{)367.1}$	$5\overline{)2300.45}$
(*B*)	$9\overline{)20.151}$	$6\overline{)502.902}$	$3\overline{)2011.18}$	$8\overline{)17.56}$

1. How many pints are there in 45.6 quarts?

2. James Clark has \$14.35. Robert Brown has \$9.97. James says he has 40 per cent more money than Robert has. Is James right? Prove your answer.

3. Subtract 71 cents from \$1.63.

4. What is $\frac{3}{5}$ of \$10.40?

5. Mr. Wolf sold \$1012.50 worth of electric trains. Each train was sold at \$13.50. How many trains did Mr. Wolf sell?

6. How many quarts are there in 63 gallons?

7. Mr. Rayburn bought 36 sleds at \$1.25 each. How many sleds must he sell at \$1.98 each to receive as much money as the sleds cost him?

8. $564 \div 84 = ?$ (Get three decimal places in your answer.)

9. How many inches are there in 7.32 feet?

10. How many pounds are there in 153.6 ounces?

11. The Poughkeepsie bridge is 6767 feet long. How many yards is that?

12. How many feet are there in .6532 of a mile?

13. At the rate of 8.5 miles per hour, how far can Clyde Barnes ride in .9 hour?

14. An overcoat was priced at $39.50, but Mr. Carter bought it at a sale for $21.65. How much discount did the store allow?

15. Four bushels of apples containing 75 apples each were offered for sale at $3.00 per bushel or at 5 cents per apple. Mrs. Simple bought the four bushels, but 20 per cent of the apples spoiled before she could use them. Did Mrs. Simple save anything by buying the four bushels at once? If so, how much money did she save?

16. The regular price for footballs is $10.00. Tim Murphy has $8.00 and is watching for a sale of footballs. What per cent discount must the store offer before Tim can buy a football for $8.00?

Subtracting Mixed Numbers with Unlike Denominators

Example (*A*). Find the difference between $6\frac{7}{12}$ and $6\frac{2}{3}$.

We find the difference by subtraction, but we cannot subtract in this case until we know which number is more. Since the whole numbers are the same, the difference lies wholly in the fractions. We change $\frac{2}{3}$ to twelfths: $\frac{2}{3} = \frac{8}{12}$. Now we are to find the difference between $6\frac{7}{12}$ and $6\frac{8}{12}$. Since $6\frac{8}{12}$ is more than $6\frac{7}{12}$, we put it above $6\frac{7}{12}$, and subtract $6\frac{7}{12}$ from $6\frac{8}{12}$. The answer is $\frac{1}{12}$. Notice that we think 6 from 6 are zero, but we do not write the zero in front of $\frac{1}{12}$.

$$\begin{array}{r} 6\frac{8}{12} \\ 6\frac{7}{12} \\ \hline \frac{1}{12} \end{array}$$

Find the differences between these numbers:

1. $2\frac{1}{2}$ and $2\frac{1}{3}$.
2. $6\frac{1}{3}$ and $6\frac{1}{4}$.
3. $8\frac{2}{3}$ and $8\frac{3}{4}$.
4. $9\frac{5}{12}$ and $9\frac{1}{2}$.
5. $10\frac{5}{6}$ and $10\frac{11}{12}$.
6. $7\frac{13}{16}$ and $7\frac{7}{8}$.
7. $12\frac{1}{3}$ and $12\frac{1}{6}$.
8. $1\frac{2}{3}$ and $1\frac{5}{8}$.
9. $16\frac{5}{8}$ and $16\frac{9}{16}$.
10. $87\frac{1}{2}$ and $87\frac{1}{8}$.

When fractions have the same numerators, you can tell which is more by looking at the denominators. Can you explain how?

Example (*B*). Find the difference between $8\frac{1}{6}$ and $3\frac{1}{3}$.

We change $\frac{1}{3}$ to sixths. Then we write $\begin{array}{r} 8\frac{1}{6} \\ \underline{3\frac{2}{6}} \end{array}$.

Subtracting, we have $4\frac{5}{6}$, which is the correct answer.

Find the differences:

	(1)	(2)	(3)	(4)	(5)
(*A*)	\$12.13	\$12.19	\$134.39	\$156.46	\$156.74
	9.96	4.50	44.41	89.11	99.96
(*B*)	\$13.57	\$13.34	\$127.53	\$172.23	\$185.46
	8.91	7.49	48.62	75.15	91.87

1. How many dozen sticks of candy will it take to give 6 sticks to each of 95 children for Christmas?

2. The enrollment in the sixth-grade room is 48. The number of pupils present on Monday was 38. What per cent of the pupils were absent?

In the next examples subtract the fractions first. Carry when necessary.

Find the differences:

	(1)	(2)	(3)	(4)
(*A*)	$4\frac{5}{6}$	$7\frac{1}{8}$	$25\frac{1}{2}$	$17\frac{1}{4}$
	$2\frac{1}{3}$	$5\frac{3}{16}$	$19\frac{1}{6}$	$9\frac{1}{3}$
(*B*)	$6\frac{3}{4}$	$9\frac{5}{12}$	$20\frac{3}{16}$	$87\frac{5}{12}$
	$5\frac{2}{3}$	$6\frac{1}{2}$	$10\frac{1}{4}$	$44\frac{1}{3}$
(*C*)	$6\frac{2}{3}$	$4\frac{1}{8}$	$8\frac{5}{12}$	$16\frac{1}{4}$
	$1\frac{5}{6}$	$3\frac{1}{6}$	$3\frac{5}{6}$	$9\frac{1}{6}$

Problems in Subtraction of Mixed Numbers

1. Frank is $5\frac{1}{6}$ feet tall. John is $4\frac{2}{3}$ feet tall. How much will John have to grow before he will be as tall as Frank is now?

2. Mr. James has a gasoline tank that holds just $40\frac{3}{8}$ gallons. He filled it last week. Since that time he has pumped out $19\frac{3}{4}$ gallons. How many gallons are left in the tank?

---

1. There are about 75 apples in a bushel of apples. Which is cheaper, to buy a bushel at one time for \$3.00 or to buy 75 apples at 5 cents each at various times? How much cheaper?

2. Tom Stone bought a school suit for \$15.95. He paid for the suit with a check for \$19.51. What per cent of the amount of his check did Tom have left?

3. One gallon of milk weighs 8.3 pounds. What is the weight of 30 gallons of milk?

3. It is just $10\frac{1}{5}$ miles from the village to our home. Yesterday my brother was driving home from the village. When he was $6\frac{3}{8}$ miles from the village, the car broke down and he had to walk the rest of the way. How far did he walk?

4. Mary Jones weighed just $87\frac{9}{16}$ pounds one year ago today. Now she weighs $102\frac{7}{8}$ pounds. How much has she gained in weight during the year?

5. Arthur Goodson has promised to pick 40 gallons of cherries. At noon today he had picked only $28\frac{3}{4}$ gallons. How many gallons more must he pick in order to keep his promise?

6. Kate Gordon is $4\frac{2}{3}$ feet tall. Mary Carter is $4\frac{5}{6}$ feet tall. Which girl is taller? How much taller?

7. Helen Anderson weighed $105\frac{1}{16}$ pounds on October 1. On November 1 she weighed $105\frac{1}{10}$ pounds. The average increase in weight per month for a girl of Helen's age is $1\frac{1}{8}$ pounds. Did Helen gain more or less than the average? How much more or less?

8. James and William estimated the weight of a load of coal. James's estimate was $2\frac{1}{4}$ tons. William's estimate was $1\frac{7}{8}$ tons. The actual weight of the coal was $2\frac{1}{8}$ tons. Which boy made the better estimate? Prove your answer.

---

1. When Mrs. Kane moved, she sold for \$45.00 a table which cost her \$60.00 when new. How much had the table decreased in value? What was the per cent of decrease?

2. Change $\frac{4}{5}$ to a decimal.

3. How many feet are there in 571 yards?

9. James Hool weighs $97\frac{1}{4}$ pounds. The standard weight for boys of his age and height is 102 pounds. How much does James lack of being up to the standard?

Multiplying with Fractions

When you multiply, the answer, or result, that you get is called the **product.** The number that you multiply by is called the **multiplier,** and the number that you multiply is called the **multiplicand.** In the fifth grade you learned something about multiplying with fractions and mixed numbers. You have had many examples like these:

Examples

(*A*) $\frac{3}{8}$ of $16 = ?$

(*B*) $\frac{3}{4}$ of $25 = ?$

You have learned that in examples like (*A*) and (*B*) you can change the word " of " to a $\times$ sign. In example (*A*) you can write $\frac{3}{8}$ of $16 = \frac{3}{\cancel{8}} \times \overset{2}{\cancel{16}} = 6,$

or $$\frac{3}{8} \text{ of } 16 = \frac{3 \times 16}{8} = \frac{48}{8} = 6.$$

In example (*B*) write $\frac{3}{4}$ of $25 = \frac{3 \times 25}{4} = \frac{75}{4} = 18\frac{3}{4}.$

1. How many quarts are there in 8.41 pecks?
2. What is the difference between 96 cents and $1.81?
3. Find the interest on $675 for 30 days at 6 per cent.
4. How many minutes are there in 60 hours?
5. A milk company sold 23,000 quarts of milk in one day. How many gallons was that?

Some Things to Remember

1. There are two ways to solve examples like $\frac{3}{8}$ of $16 = ?$
2. There is only one way to solve examples like $\frac{3}{4}$ of $25 = ?$
3. You can always multiply the numerator by the whole number and divide by the denominator.

Now we are going to study some further ways of multiplying. Heretofore the answer, or product, has always been a whole number or a mixed number. But there is a kind of exercise in multiplication in which the product is a fraction. Here are two such exercises:

Examples

(*A*) How much is $\frac{1}{2}$ of $\frac{1}{4}$?

$$\frac{1}{2} \text{ of } \frac{1}{4} = \frac{1}{2} \times \frac{1}{4} = \frac{1}{8}.$$

(*B*) Multiply $\frac{1}{2}$ by $\frac{2}{3}$.

$$\frac{2}{3} \times \frac{1}{2} = \frac{2}{6} = \frac{1}{3}, \text{ or } \frac{\cancel{2}}{3} \times \frac{1}{\cancel{2}} = \frac{1}{3}.$$

In example (*A*) we change " of " to $\times$. Then we multiply the two numerators (1×1) to get the new numerator and

---

1. What is $\frac{1}{12}$ of 2.4 inches?
2. How many ounces are there in 8.4 pounds?
3. How many quarts are there in 108 pints?
4. Mr. Wilson has a road map on which 1 inch represents 25 miles. How many inches will it take to represent 300 miles on Mr. Wilson's map?
5. How many miles will 3.5 inches represent on this map?

we also multiply the two denominators (2×4) to get the new denominator.

In example (*B*) we can use the same method or we can cancel.

Something to Think About

In multiplication sometimes the product is more than either of the numbers multiplied, as in $4 \times 2 = 8$; sometimes it is less than one of the numbers multiplied, as in $\frac{1}{2} \times 16 = 8$; and sometimes it is less than either of the numbers which were multiplied, as in $\frac{1}{2} \times \frac{1}{4} = \frac{1}{8}$.

Find the products:

	(1)	(2)	(3)
(*A*)	$\frac{1}{2} \times \frac{1}{3} = ?$	$\frac{1}{4} \times \frac{5}{8} = ?$	$\frac{2}{3} \times \frac{7}{12} = ?$
(*B*)	$\frac{1}{3} \times \frac{2}{3} = ?$	$\frac{2}{3} \times \frac{9}{16} = ?$	$\frac{1}{3} \times \frac{3}{16} = ?$
(*C*)	$\frac{1}{4} \times \frac{1}{6} = ?$	$\frac{3}{4} \times \frac{5}{12} = ?$	$\frac{3}{8} \times \frac{7}{16} = ?$
(*D*)	$\frac{1}{8} \times \frac{11}{16} = ?$	$\frac{5}{6} \times \frac{1}{12} = ?$	$\frac{1}{4} \times \frac{5}{16} = ?$
(*E*)	$\frac{1}{2} \times \frac{15}{16} = ?$	$\frac{1}{2} \times \frac{3}{8} = ?$	$\frac{3}{4} \times \frac{1}{16} = ?$
(*F*)	$\frac{1}{3} \times \frac{11}{12} = ?$	$\frac{1}{4} \times \frac{7}{8} = ?$	$\frac{1}{2} \times \frac{5}{12} = ?$

What are the differences?

1	2	3	4	5
\$13.63	\$12.54	\$87.04	\$10.22	\$60.76
7.64	3.67	42.10	9.88	13.99

People who sell goods for others often receive a per cent of the amount which they sell as payment for their services. This amount is called **commission.**

6. Mr. Kane sold four hundred dollars' worth of goods at a commission of 5 per cent. What was the amount of Mr. Kane's commission?

Multiplying with Mixed Numbers

Example (*A*). Find the product: $20 \times 5\frac{3}{4}$.

$$\begin{array}{r} 20 \\ \times\ 5\frac{3}{4} \\ \hline 15 \\ 100 \\ \hline 115 \end{array} \qquad \frac{3}{4} \times 20 = 15$$

We multiply 20 by $\frac{3}{4}$, getting 15. Then we multiply 20 by 5, getting 100. The answer is the sum of 100 and 15. See that the right-hand edges are even when you add.

---

1. 1824 is how many times 36?

2. Nine hundred feet are about what per cent of 1 mile?

3. To begin with there was $1.80 in the treasury of the Rinky Dink Club. Perry added 62 cents to it. Chink gave 15 cents. Bob's mother gave a quarter of a dollar, and Bill's dad gave 50 cents. Then the club bought a new basketball for $2.85. How much money was left in the treasury?

4. What is the discount on a bill for $500.00 at 15% off?

5. The post-office building was built in 1876. The city hall was built in 1880. Which building is older? How much older?

6. Mr. Jones bought the following articles:

1 box Jonathan apples	$3.35
5 lb. butter	2.75
1 pt. cream	.29

What was the total of his bill?

7. How many pounds are there in 361.6 ounces?

Example (*B*). Find the product: $16\frac{3}{4} \times 15$.

$16\frac{3}{4}$
15
$11\frac{1}{4}$
80
16
$251\frac{1}{4}$

$15 \times \frac{3}{4} = \frac{4\,5}{4} = 11\frac{1}{4}$

We multiply $\frac{3}{4}$ by 15, obtaining $11\frac{1}{4}$. We write this below the line so that the $\frac{1}{4}$ will be just below the $\frac{3}{4}$. Then we multiply 16 by 15, placing the 80 just under the 11.

Find the products:

	(1)	(2)	(3)	(4)	(5)
(*A*)	$30\frac{1}{4}$	$5\frac{1}{2}$	100	$8\frac{5}{12}$	25
	80	25	$66\frac{2}{3}$	75	$75\frac{3}{8}$
(*B*)	60	32	75	29	5
	$16\frac{2}{3}$	$8\frac{3}{8}$	$67\frac{1}{3}$	$37\frac{1}{2}$	$3\frac{3}{16}$

Find the sums:

1	2	3	4	5
2920	8990	9980	2030	3252
7766	4807	2112	8461	9967
2897	4058	3914	5939	3670
9224	1492	7137	2759	5466
5042	7145	4717	5463	2634
1265	1383	7370	8425	4106
4319	5607	728	3275	3423
6554	2226	88	3214	2479

6. If six balls cost 50 cents, find the exact cost of one ball.

Example (*C*). Divide $1\frac{3}{4}$ pounds of candy equally among 7 children.

Since the candy is to be divided into seven equal parts, each part will be $\frac{1}{7}$. This means that we want to find $\frac{1}{7}$ of $1\frac{3}{4}$.

We first change $1\frac{3}{4}$ to fourths: $1\frac{3}{4} = \frac{7}{4}$.

$$\tfrac{1}{7} \text{ of } \tfrac{7}{4} = \tfrac{1}{4}.$$

Hence, $$\tfrac{1}{7} \text{ of } 1\tfrac{3}{4} = \tfrac{1}{4}.$$

Example (*D*). What is $\frac{1}{7}$ of $2\frac{3}{5}$?

$$2\tfrac{3}{5} = \tfrac{13}{5}.$$

$$\tfrac{1}{7} \text{ of } \tfrac{13}{5} = \tfrac{13}{35}.$$

Hence, $$\tfrac{1}{7} \text{ of } 2\tfrac{3}{5} = \tfrac{13}{35}.$$

Find the answers in the following exercises:

1. What is $\frac{1}{8}$ of $16\frac{2}{3}$?
2. What is $\frac{1}{4}$ of $8\frac{1}{3}$?
3. What is $\frac{1}{3}$ of $12\frac{1}{2}$?
4. What is $\frac{1}{6}$ of $4\frac{1}{2}$?
5. What is $\frac{1}{2}$ of $3\frac{5}{16}$?
6. What is $\frac{1}{5}$ of $3\frac{1}{3}$?

7. A barrel usually contains $31\frac{1}{2}$ gallons. If you divide the contents of a barrel into three equal parts, how many gallons will there be in each part?

8. The girls in our room wish to make 30 badges. They have $6\frac{2}{3}$ yards of ribbon. What part of a yard will there be in each badge?

---

1. We call all the games that we play in one season 100 per cent. This year we lost 50 per cent of our games. What per cent of our games did we either win or tie?

2. Find the area of a floor that is 20.5 feet wide and 30.25 feet long.

9. The relief committee have $15\frac{3}{4}$ pounds of candy to give to 18 poor children. What part of a pound shall they give to each child if all are to receive equal shares?

10. A man who is lost in a desert has $2\frac{1}{2}$ gallons of water. What part of a gallon may he drink each day if it takes 10 days for his rescuers to find him?

11. A party of campers has been snowbound. They expect the snow to melt in seven days. They have $40\frac{3}{4}$ pounds of food. How many pounds may they use per day?

12. During a coal famine it was necessary to divide $8\frac{1}{3}$ tons of coal equally among 15 families. What part of a ton did each family get?

Add these columns:

1	2	3	4	5
$50.00	$93.10	$88.81	$76.54	$89.00
88.65	90.78	37.07	69.37	76.64
85.00	29.85	17.69	45.52	90.99
29.91	60.80	80.46	39.48	81.04
70.18	19.11	18.33	53.26	39.90
16.68	67.62	47.00	22.17	10.03
35.82	20.05	60.19	48.29	14.79
11.35	16.56	22.90	81.66	5.19

6. 6324 is how many times 62?

Example (*E*). How much is $\frac{3}{8}$ of $6\frac{1}{4}$?

$$\tfrac{3}{8} \text{ of } 6\tfrac{1}{4} = \tfrac{3}{8} \times 6\tfrac{1}{4} = \tfrac{3}{8} \times \tfrac{25}{4} = \tfrac{75}{32} = 2\tfrac{11}{32}$$

Study the solution of Example (*E*) so that you can solve another one like it.

Find the products:

	(1)	(2)
(*A*)	$\frac{3}{8} \times 6\frac{2}{3} = ?$	$\frac{3}{16} \times 13\frac{1}{3} = ?$
(*B*)	$\frac{5}{6} \times 7\frac{1}{2} = ?$	$\frac{3}{8} \times 5\frac{1}{2} = ?$
(*C*)	$\frac{4}{5} \times 3\frac{1}{3} = ?$	$\frac{7}{8} \times 30\frac{1}{4} = ?$
(*D*)	$\frac{2}{3} \times 6\frac{3}{5} = ?$	$\frac{5}{16} \times 11\frac{3}{7} = ?$
(*E*)	$\frac{5}{8} \times 5\frac{3}{9} = ?$	$\frac{3}{5} \times 16\frac{2}{3} = ?$

Example (*F*). How much is $5\frac{1}{2} \times 5\frac{1}{2}$?

$$5\tfrac{1}{2} \times 5\tfrac{1}{2} = \tfrac{11}{2} \times \tfrac{11}{2} = \tfrac{121}{4} = 30\tfrac{1}{4}$$

When we multiply one mixed number by another, we reduce both of them to improper fractions. Then we multiply the numerators for a new numerator and the denominators for a new denominator. Then we reduce the answer to a mixed number. We cancel if we can.

Solve the following examples:

	(1)	(2)
(*A*)	$1\frac{3}{8} \times 2\frac{1}{2} = ?$	$16\frac{1}{2} \times 16\frac{2}{3} = ?$
(*B*)	$8\frac{1}{3} \times 10\frac{3}{4} = ?$	$30\frac{1}{4} \times 30\frac{1}{4} = ?$
(*C*)	$30\frac{1}{4} \times 1\frac{5}{6} = ?$	$16\frac{5}{8} \times 15\frac{1}{2} = ?$
(*D*)	$1\frac{1}{4} \times 62\frac{1}{2} = ?$	$18\frac{3}{4} \times 33\frac{1}{3} = ?$
(*E*)	$3\frac{1}{2} \times 66\frac{2}{3} = ?$	$80\frac{5}{12} \times 70\frac{2}{3} = ?$

Using Rods, Yards, and Feet

Use this list of facts for reference. Memorize them as quickly as you can, if you do not already know them.

$5\frac{1}{2}$ yards = 1 rod
$16\frac{1}{2}$ feet = 1 rod
$30\frac{1}{4}$ square yards = 1 square rod

1. Mr. Jones has a field 20 rods long and 40 rods wide. How much will he have to pay for enough fencing to go all the way around the field if the fencing will cost him 14 cents a foot?

2. How much will it cost to pave a piece of road 320 rods long and $1\frac{1}{4}$ rods wide if paving, including material and labor, costs $2.25 per square yard?

3. The boys in our school want to lay off a race track 100 yards long. Mr. Anderson has a field which extends 20 rods along the road. In this field he will allow the boys to make their race track next to the road. Is this distance long enough for a 100-yard track? Prove your answer.

---

1. Mr. Brooks bought a lot for $960. Two years later he sold the lot for 20 per cent more than he paid for it. How much did Mr. Brooks get for his lot?

2. If 4 ounces is the average amount of meat required for a person per day, how many pounds of meat will be needed each day to feed a city of 9243 persons?

3. What per cent of 6 is 4?

4. How many rods are there in three tenths of a mile?

5. How many yards are there in 96 rods?

6. How many square yards are there in one acre?

7. Mr. Smith wishes to make an excavation 1 rod wide, 2 rods long, and 1 yard deep. If 1 cubic yard of dirt makes a load, how many loads of dirt will he have in all?

8. A baseball field of standard size is a square containing 3600 square yards. The Red Sox ball team are looking for a place to play. They can get a lot 10 rods square. Is this large enough? Prove your answer.

9. What will 60 feet of garden hose cost at $16\frac{2}{3}$ cents a foot?

10. What will a dozen and a half toy balloons cost at $1\frac{3}{4}$ cents each?

11. A merchant bought 50 teapots at $66\frac{2}{3}$ cents each and sold them at 80 cents each. How much did he make in all?

---

1. What per cent is $\frac{1}{5}$?

2. Mr. Price has cabbages to sell. He weighed 5 heads of cabbage and found that their average weight was 4.2 pounds. How much will 75 heads of cabbage weigh at this rate?

3. How many feet are there in 3.16 miles?

4. How many boxes of shoe blacking at 8 cents each must a person sell to pay a bill of $70.24?

5. A company charges $11.85 for a boat trip. If 35 persons go on the trip, how much should each person pay?

Finding Areas of Squares and Rectangles

We find the area of a square or rectangle when we multiply the length by the width. In a square, the length and the width are the same. The length and the width are sometimes called dimensions. If the dimensions are in inches, the area is in square inches. If the dimensions are in feet, the answer is the number of square feet. This holds true for yards, rods, and miles also.

Both dimensions must be in the same terms, or units, before we try to find the area; that is, they must both be inches, feet, yards, rods, or miles. If they are not the same, one or both of them must be changed so that they will be the same.

Problem (*A*). What is the area of a concrete road 160 rods long and 18 feet wide?

Here one dimension is in rods and the other in feet, and one or more changes must be made. There are always two or more ways to make the changes. In this example we can change the 160 rods to feet or we can change the 18 feet to rods, or we can change both dimensions into yards.

Find the quotients:

1	2	3	4
$9\overline{)2132.12}$	$7\overline{)49.021}$	$5\overline{)295.15}$	$8\overline{)92.8152}$

5. The list price of a sweater was $8.03. The discount was $2.25. What was the net price?

Plan I

If we change the 160 rods to feet, we have

$$160 \times 16\tfrac{1}{2} \text{ ft.} = 2640 \text{ ft.}$$
$$18 \times 2640 = 47{,}520.$$

So the area of the road is 47,520 sq. ft.

Plan II

If we change the 18 feet into rods, we have

$$18 \text{ ft.} \div 16\tfrac{1}{2} \text{ ft.} = \tfrac{12}{11}.$$
$$160 \times \tfrac{12}{11} = \tfrac{1920}{11}.$$
$$\tfrac{1920}{11} = 174\tfrac{6}{11}.$$

So the area of the road is $174\frac{6}{11}$ sq. rd.

The pupil should use either Plan I or Plan III until he has studied division by mixed numbers, on page 293.

Plan III

If we change both dimensions into yards, we have

$$160 \times 5\tfrac{1}{2} \text{ yd.} = 880 \text{ yd.}$$
$$18 \text{ ft.} \div 3 \text{ ft.} = 6.$$
$$880 \times 6 = 5280.$$

So the area of the road is 5280 sq. yd.

Problem (*B*). Find the area of the floor in a room which is $14\frac{1}{4}$ feet long and $12\frac{2}{3}$ feet wide.

$$14\tfrac{1}{4} \times 12\tfrac{2}{3} = \frac{\overset{19}{\cancel{57}}}{\underset{2}{\cancel{4}}} \times \frac{\overset{19}{\cancel{38}}}{\cancel{3}} = \frac{361}{2} = 180\tfrac{1}{2}.$$

So the area of the floor is $180\frac{1}{2}$ sq. ft.

Here both dimensions are in feet, and so no changes are necessary. We change each mixed number to an improper fraction and multiply. We write square feet after the answer because both dimensions are in feet.

Find the areas of the following surfaces. Be sure to make changes when necessary. Use a plan that will make the work as short and easy as possible. Be sure to write the proper words after your answer.

1. A garden $16\frac{2}{3}$ yards by $13\frac{1}{3}$ yards.
2. A floor $12\frac{1}{2}$ feet square.
3. A ranch $5\frac{1}{2}$ miles $\times$ $6\frac{3}{4}$ miles.
4. A field $40\frac{1}{3}$ rods $\times$ $80\frac{1}{2}$ rods.
5. A lot $48\frac{1}{3}$ feet $\times$ $149\frac{1}{2}$ feet.
6. A block of wood $2\frac{3}{4}$ inches $\times$ $5\frac{1}{2}$ inches.
7. A fresh-air inlet $2\frac{3}{4}$ feet by $2\frac{1}{3}$ feet.
8. A porch $19\frac{2}{3}$ feet long by $10\frac{1}{2}$ feet wide.
9. The top of a desk $4\frac{1}{3}$ feet long by $2\frac{1}{6}$ feet wide.
10. A concrete walk $\frac{1}{4}$ mile long and 4 feet wide.

---

1. The children in our sixth grade wrote down the temperature at the end of each hour last Monday morning. This is what they found: 8 o'clock, 14 degrees; 9 o'clock, 17 degrees; 10 o'clock, 18 degrees; 11 o'clock, 19 degrees; and 12 o'clock, 22 degrees. What was the average temperature for the morning?
2. Change $\frac{2}{7}$ to a decimal of four places.
3. How many pints are there in 2 quarts?
4. How many quarts are there in 2 pints?

11. A road 1 mile long and 30 feet wide.

12. Some of the children of the Washington School want to have a school garden. They prefer to have all of the garden in a single piece of land, but will plant two or more smaller gardens if they have to. Two hundred of the children wish to plant gardens. They have found a piece of land that they can get. How many of the children can make their gardens on this piece of land if it is 64 yards square and if each child is given an area one rod square? (An area one rod square is a square whose sides are each $16\frac{1}{2}$ feet long.)

13. How many square yards more must be found somewhere else?

14. The children know of three vacant lots which are each 64 feet wide and 80 feet long. Are these lots large enough to furnish an area one rod square to each of the children who cannot have gardens on the larger area? Prove your answer.

Practice Exercises

1. $206 \times \$682.01 = ?$

2. $578 \times \$89.21 = ?$

3. $389 \times \$78.34 = ?$

4. $\$11.04 \div 8 = ?$

5. $\$8023.05 \div 9 = ?$

6. $\$5093.22 \div 6 = ?$

7. At 7 cents each, how many street-car tickets can you buy with \$6.13?

8. $3900 \div 65 = ?$

9. How many gallons are there in 9012 quarts?

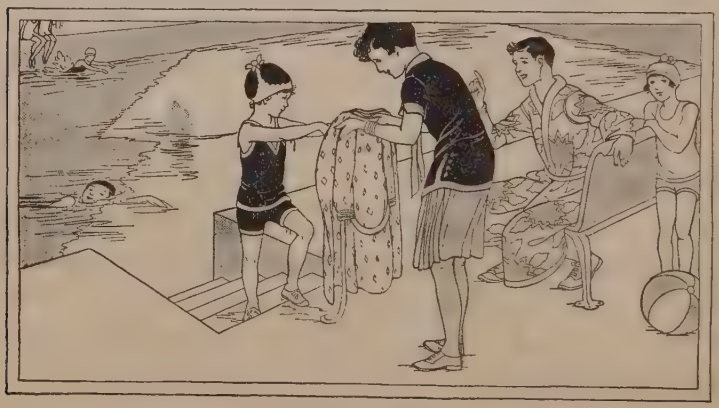
10. There were 1860 books in our school library. We rebound 20 per cent of them. How many books did we rebind?

11. Find the sum of \$1413, \$5839, and \$2648.

12. How many bunches of beets at 7 cents each can you buy for \$3.36?

13. How many quarts are there in 6.8 gallons?

14. Our electric-light bill for the month of July was \$2.35. We paid it before the tenth of August and so we were allowed a discount of 8 per cent. How much did we have to pay? (Do not count fractions of cents in discounts.)



15. Julia Edwards is taking lessons in swimming. Today she made four trials at swimming 15 feet. Each time her teacher counted the number of strokes that she made. This is her record on the four trials: first trial, 5 strokes; second trial, 4 strokes; third trial, 7 strokes; fourth trial, $5\frac{1}{2}$ strokes. What was her average number of strokes at each trial?

16. Our schoolroom is 30 feet long. How many inches long is the schoolroom?

17. What is $\frac{2}{9}$ of 702?

18. The Washington Monument is 555 feet high. How many yards is that?

19. There are 13 members in our Boy Scout troop. At our last meeting 9 boys were present. What was the per cent of attendance?

Finding Volumes

When we find how many cubic inches, cubic feet, or cubic yards there are in a box, bin, or room, we are finding the volume. When the length, width, and depth of a box are measured in inches, the volume is usually measured in cubic inches. When these dimensions are measured in feet, as in a tank, the volume is usually measured in cubic feet. When the three dimensions are measured in yards, the volume is usually measured in cubic yards. Sometimes we speak of thickness or height instead of depth; that is, thickness and height are other names for one of the three dimensions. We may find the volume quickly by multiplying the dimensions together. But we must be sure before we do this that all three dimensions are in the same unit; that is, they must all be inches, all feet, or all yards, and so on.

Problem (*A*). How many cubic inches are there in a piece of lumber which is $7\frac{1}{2}$ feet long, $2\frac{1}{4}$ inches wide, and $1\frac{1}{2}$ inches thick?

Since 1 foot = 12 inches,

$7\frac{1}{2}$ feet = $7\frac{1}{2} \times 12$ inches, or 90 inches.

$2\frac{1}{4}$ inches = $\frac{9}{4}$ inches.

$1\frac{1}{2}$ inches = $\frac{3}{2}$ inches.

$$\overset{45}{\cancel{90}} \times \frac{9}{4} \times \frac{3}{\cancel{2}} = \frac{1215}{4} = 303\tfrac{3}{4}.$$

The answer to Problem (*A*) is $303\frac{3}{4}$; that is, there are $303\frac{3}{4}$ cubic inches in the piece of lumber.

Two of the dimensions of this piece of lumber were in inches but one was in feet. We changed the $7\frac{1}{2}$ feet to inches so as to have all three dimensions in inches. We changed $2\frac{1}{4}$ and $1\frac{1}{2}$ inches to improper fractions. Then we multiplied the three dimensions just as we have been multiplying when there were only two numbers. The product of the three dimensions is $\frac{1215}{4}$, or $303\frac{3}{4}$, which, as we have seen, is the number of cubic inches in the piece of lumber.

In writing dimensions we often need a short form to help save time. The dimensions in Problem (*A*) were length $7\frac{1}{2}$ feet, width $2\frac{1}{4}$ inches, and thickness $1\frac{1}{2}$ inches. People who are in a hurry often write these dimensions in this form: $7\frac{1}{2}' \times 2\frac{1}{4}'' \times 1\frac{1}{2}''$. In such cases the sign $'$ stands for *feet*, $''$ stands for *inches*, and $\times$ means *by*. The first number is the length, the second the width, and the third the thickness.

Look at the dimensions of these boxes and write out on your tablets what changes you must make before you multiply the dimensions together, when the answer is to be in cubic inches:

Box A, $6' \times 3' \times 6''$
Box B, $5' \times 9'' \times 8''$
Box C, 1 yd. $\times$ $2\frac{1}{2}$ ft. $\times$ 9 in.
Box D, $3\frac{1}{2}$ ft. $\times$ 1 ft. $\times$ 7 in.

What changes shall you have to make if the answer is to be in cubic feet? Shall you have to change two of the dimensions of any of the boxes?

Problem (*B*). How many cubic feet of air space are there in a schoolroom $23\frac{1}{2}' \times 19\frac{1}{4}' \times 12\frac{1}{3}'$?

Here the dimensions are all in feet, so we can multiply without changing them.

$$23\tfrac{1}{2} \times 19\tfrac{1}{4} \times 12\tfrac{1}{3} = \tfrac{47}{2} \times \tfrac{77}{4} \times \tfrac{37}{3} = \tfrac{133903}{24} = 5579\tfrac{7}{24}.$$

The amount of air space is $5579\frac{7}{24}$ cu. ft.

Find the volumes in the following examples. Be sure to make the changes that are necessary. Tell whether your answer is cubic inches, cubic feet, or cubic yards.

1. A tank $5' \times 3' \times 2'\ 6''$.
2. A beam $10\frac{1}{2}' \times 8\frac{1}{4}'' \times 6\frac{1}{2}''$.
3. A board $12' \times 8'' \times 1'$.
4. A box $6' \times 1\frac{1}{2}' \times 9''$.
5. A beam $10' \times 8'' \times 6''$.
6. A room $16\frac{1}{2}' \times 12\frac{1}{3}' \times 10\frac{2}{3}'$.
7. A basement $8\frac{1}{3}$ yd. $\times\ 6\frac{2}{3}$ yd. $\times\ 1\frac{1}{2}$ yd.

Find the totals:

1	2	3	4	5
				$98.91
$55.00				98.99
38.27	$4.10	$6.94	$7.10	93.29
6.00	.11	.46	.43	38.00
9.47	.26	.67	1.75	18.67
4.35	.44	1.78	.17	40.85
66.42	.69	.25	.79	1.37
140.47	5.03	.25	.85	.02

8. A wagon box $10' \times 3' \times 14''$.

9. A crib $12\frac{1}{2}' \times 10\frac{1}{3}' \times 8\frac{1}{4}'$.

10. A mortar box $8\frac{1}{3}' \times 4\frac{1}{2}' \times 10''$.

11. Mr. Carter is planning to build a new house. The house is to be 30 feet long and 27 feet wide, outside measurements. The basement is to extend under the whole house and the bottom of the basement is to be 5 feet below the surface of the ground. How many cubic yards of earth must Mr. Carter have removed?

12. The dirt will be hauled away in wagons. The part of the wagon which contains the dirt is called the wagon bed. The wagon beds are 1 foot deep, 3 feet wide, and 10 feet long. Dirt occupies $\frac{1}{3}$ more space after it is dug. About how many wagon-loads must be hauled?

13. The coal bin in our basement is 8 feet long, 8 feet wide, and 5 feet deep. If a bushel of coal occupies 2150 cubic inches, will the bin hold 250 bushels? Prove your answer.

---

1. James Chester has a check for \$31.12 with which he wishes to buy tennis rackets. Tennis rackets cost \$5.25. How many tennis rackets can James buy and how much money will he have left over?

2. An automobile dealer bought 14 cars. They cost him \$7500.00, including all expenses. He sold them all at an average of \$626.00 each. What was his per cent of gain?

3. Mr. Smith and Mr. Jones each estimated the size of the crowd at the football game. Mr. Smith thought there were 3500 present. Mr. Jones estimated the crowd at 3700. The correct number was 3548. Which man made the better estimate? Prove your answer.

14. For hauling wheat, farmers usually put extra side boards on their wagons. This makes the beds 2 feet deep. If the beds are 10 feet long and 3 feet wide, about how many bushels of wheat will a wagon bed hold, allowing 2150 cubic inches for each bushel?

15. We store apples in our cellar in a compartment which is 6 feet long, 3 feet wide, and 4 feet deep. Will this compartment hold 35 bushels of apples? Prove your answer.

16. The children in the fifth grade want to make covers for their books. They plan to make them out of strong wrapping paper. Each book cover is 12 inches by 16 inches. The paper comes in rolls 3 feet wide. How many feet of paper of this width must they buy if they make covers for 126 books?

17. Mr. Adams is planning to plant a large apple orchard in a field 440 yards long and 220 yards wide. If each tree when grown will cover an area 30 feet square, how many trees should he buy?

---

1. A basketball team scored a total of 144 points in 9 games. What was their average for each game?
2. Running at a speed of 35 miles per hour, how far will a train travel in 2.5 hours?
3. John Barton had \$9.21 when he came to the village. When he got ready to go home, he had \$3.33 left. What per cent of his \$9.21 had he spent?
4. What is $\frac{1}{9}$ of 912.663?
5. \$512.08 is how many times 8 cents?
6. How many ounces are there in 4.7 pounds?

18. Mrs. Smith has a cabbage patch 50 feet long and 40 feet wide. When she set out her plants, she allowed an area of 20 inches square for each plant. If all the plants grow, how many cabbage heads will Mrs. Smith have?

19. A land company has bought up a large amount of land in our neighborhood. They plan to divide each square mile of it into farms 440 yards wide and 880 yards long and sell them. How many such farms can they make out of a square mile?

20. In a standard schoolroom the area of the glass in the windows should equal $\frac{1}{5}$ of the area of the floor. See if your room is up to standard in this respect.

21. Mr. Jones wishes to build a concrete walk from his front porch to the sidewalk. He measured the distance with a 10-yard rope and found it to be one 10-yard length, 6 yards, and 2 feet. He plans to make the walk 3 feet wide. How many square feet of concrete will it contain?

---

1. In June the Jones family bought 12 gallons of milk. The cook used $4\frac{1}{2}$ gallons and Baby Jim drank the rest. How much milk did Baby Jim drink each day?

2. How many quarts are there in 6.4 pecks?

3. How many quart jars will it take to hold 162 pints of strawberry jam?

4. How many minutes are there in .8 hours?

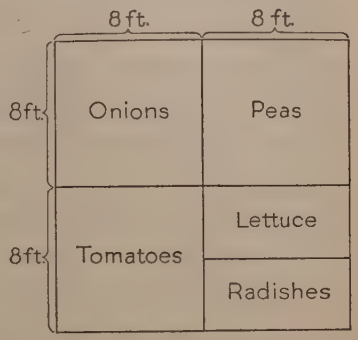
5. Neckties which sell regularly at 80 cents each are selling at 47 cents each. What is the per cent of discount?

6. How many square rods are there in 3.2 acres?

More Problems about Areas, Volumes, and Weights

1. A standard-sized schoolroom is 32 feet long, 24 feet wide, and 12 feet high. How many cubic feet does it contain? Does it contain 270 cubic yards? Prove your answer.

2. The children of the Wilson School are planting gardens this spring. Mary Sanderson's garden is 16 feet square. She plans to plant the vegetables as shown in the diagram. How many square feet are to be planted with onions?



3. Mary is going to plant her peas in rows 24 inches apart. She plans to leave a margin on each edge of the pea bed. How many rows of peas can she plant?

4. Mary expects to plant another fourth of her garden to tomatoes. If she allows 1152 square inches for each plant, how many plants will she need?

Find the differences:

1	2	3	4	5
\$14.41	\$9.12	\$42.78	\$41.16	\$69.84
4.59	1.35	16.12	19.84	66.08

6. How many feet are there in 28 yards?
7. How many feet are there in 45.6 inches?
8. How many bushels are 1206 bushels less 373 bushels?

5. She intends to plant the remaining fourth of her garden to lettuce and radishes, dividing the ground equally between the two. How many square inches will be planted in lettuce? How many in radishes?

6. Mr. Jones has a space 10 feet by 12 feet in his barn. He wishes to build a bin on this space that will contain 1000 bushels of wheat. A bushel of wheat occupies about 2150 cubic inches of space. If he makes the bin 10 feet high, will it be large enough?

7. A playground of standard size is large enough to afford 100 square feet for each pupil in the school. Find the number of pupils in your school; then measure your playground and see if it is of standard size.

8. The Midland School grounds cover one acre. One half of the grounds are playgrounds. Are the playgrounds large enough to take care of 200 children if 100 square feet are allowed for each pupil?

9. The boys and girls of this school want to play baseball. If the boys lay off an area 90 feet square and the girls lay off one 45 feet square, how much of the playground will be left?

10. Three and one-half tons is a heavy load for two strong horses on a hard, level road. The water wagon that is used on our street weighs 3300 pounds when empty and holds 550 gallons of water when full. A gallon of water weighs about 8.3 pounds. Can two strong horses pull our wagon when it is full? Give a reason for your answer.

11. Mr. Ogden hauls coal with his wagon and two horses. His wagon when empty weighs 2500 pounds. One

day he drove along the street with 60 bushels of coal on his wagon. The president of the society for the prevention of cruelty to animals had him arrested for treating his horses badly. A bushel of coal weighs 80 pounds. Was the president right? Why do you think so?

12. Mr. Adams has a truck that will carry 4 tons. How many bushels of wheat can he haul in one load if a bushel of wheat weighs 60 pounds?

13. A heaping teaspoonful is nearly two level teaspoonfuls, and a pint of sugar weighs about one pound. At our school picnic there were 240 people. If each person uses one heaping teaspoonful of sugar, how many pounds of sugar should be provided?

14. My little baby brother gained 96 ounces in 15 weeks. How many pounds was that?

15. The baby drinks 8 ounces of milk 4 times a day. If there are 16 ounces in a pint, how many quarts of milk does the baby drink in 7 days?

Find the sums:

1	2	3	4	5
$61.30	$63.10	$89.71	$88.70	$49.80
34.74	30.09	31.79	62.07	69.85
70.06	27.99	46.46	33.89	20.49
21.55	61.43	62.13	12.90	72.00
69.13	78.01	40.70	30.57	38.75
39.58	44.15	64.06	77.11	74.09
88.67	58.32	28.71	13.19	21.60
53.49	72.68	38.27	46.33	85.57
11.95	10.07	6.16	78.02	53.24

Practice Exercises

Find the totals:

1	2	3	4	5
$42.40	$40.32	$78.90	$89.90	$87.90
79.58	19.90	56.56	56.73	99.52
18.49	73.59	85.68	84.76	51.98
52.67	46.41	30.27	18.06	62.17
33.55	25.26	72.51	42.29	29.68
64.83	74.54	20.16	23.10	40.02
82.00	15.26	1.35	23.43	7.10
10.41	83.09	9.30	40.37	.07

Find the differences:

6	7	8	9	10
$12.18	$12.33	$12.19	$14.29	$8.34
3.30	8.66	2.20	7.74	1.75

11. A grocer bought 64 grapefruit for $5.12. What will be his per cent of margin if he sells them all at 10 cents each?

(The **margin** is the difference between the cost and the selling price.)

12. What is .01 of 35.4 inches?

13. How many square yards are there in a lot that is 90 feet long and 60 feet wide?

14. The Jones family is made up of father, mother, and three children. They all plan to ride on the train from Madison to Elroy, a distance of 99 miles. Full fare is 3.6 cents a mile. The children all go for half-fare. How much money will Mr. Jones have to take to buy the tickets?

15. Mr. Bloom sold five thousand dollars' worth of goods at 5 per cent commission. What was the amount of his commission?

16. Mr. Carter lost 40 per cent of his crop in a flood. What per cent of his crop did he save?

17. What is 6 per cent of $350?

18. What is $\frac{3}{5}$ of 3570?

19. Mr. Mills walked 6 miles through heavy snow to secure aid for the passengers in a stage that had broken down. It took him 5 hours. How far did he walk per hour?

20. The mail train runs 35 miles per hour. How many minutes will it take to go 28 miles?

21. Find the interest on $300.00 for one month at 6 per cent.

22. A butcher bought 48 geese for $3.59 each. What did the geese cost him?

23. Grace Blaine gets 25 cents an hour for taking care of her little cousin. Beginning April 1 she took care of her cousin $\frac{3}{4}$ of an hour each day for 32 days. Then she bought a bracelet for $2.50. What per cent of her money did she have left?

24. John Wilson is 6 feet tall. His sister Jennie is $5\frac{1}{3}$ feet tall. How many inches taller is John than Jennie?

25. How many feet are there in .9752 mile?

26. Sam Marx bought 15 cents' worth of material and made a toy ship which he sold to William Ford for 35 cents. How much did Sam get for his work?

27. A recipe for making fudge calls for $\frac{3}{4}$ cup of milk and 4 tablespoonfuls of sirup. If you could not find a tablespoon, what part of a cup of sirup would you use?

28. How many feet are there in $\frac{5}{6}$ mile?

29. What per cent of $680.00 is $54.40?

30. How many per cent is $\frac{1}{4}$?

31. What is the cost of an article that is listed "Price $12.00, $33\frac{1}{3}$ per cent off"?

Division with Fractions and Mixed Numbers

Fractions

You have learned how to divide one whole number by another. You have had division in several forms, some of which are these:

$$48 \div 6 = 8, \qquad 3\overline{)126}, \qquad \frac{6}{2} = 3$$

$$42$$

Divide 64 by 16. How many quarts in 8 pints?

When we divide one number by another, the answer is called the **quotient**; the number we divide by is called the **divisor**; and the number that we divide is called the **dividend**. Up to this time in most of the examples that we have had the dividends have been longer than the divisors and quotients and larger than the quotients, but this has not always been true. When we changed $\frac{3}{4}$ to a decimal we divided 3 by 4 and got .75 for the quotient. Here the divisor was larger than either the dividend or the

---

Find the quotients:

	(1)	(2)	(3)	(4)	(5)
(*A*)	$6\overline{)11.3058}$	$3\overline{)10.11}$	$7\overline{)5521.6}$	$8\overline{)94.152}$	$4\overline{)76.32}$
(*B*)	$9\overline{)203.301}$	$7\overline{)704.04}$	$9\overline{)33.012}$	$5\overline{)401.5}$	$6\overline{)623.52}$

1. Ruth and Thelma estimated the weight of Ruth's pet heifer. Thelma's estimate was 500 lb., Ruth's was 945 lb. The correct weight of the heifer was 800 lb. Which girl's estimate was more nearly correct? How much more?

2. What is the amount of the discount when 57 dollars' worth of goods are bought at $33\frac{1}{3}$ per cent off?

quotient. Now we are going to have some quotients that are larger than either the divisor or the dividend. When the divisor is a fraction the quotient is usually large. In the following examples the divisor is a fraction.

Suppose you are asked "How many halves are there in five?" This may also be written in other ways such as these:

In 5 there are ___?___ $\frac{1}{2}$'s.
Divide 5 by $\frac{1}{2}$.
$5 \div \frac{1}{2} = ?$
$\frac{1}{2} \times$ ___?___ $= 5$.
Five is how many times $\frac{1}{2}$?
One half is contained in 5 ___?___ times?

Every one of these means that you are to divide 5 by $\frac{1}{2}$. Here is one way to do it. First of all, we must remember that 5 means 5 ones. Halves are not the same as ones. We must make the divisor and the dividend alike before we divide. We can do this by changing the ones into halves. Since one equals $\frac{2}{2}$, five will equal $\frac{10}{2}$. Now our

---

1. Change $\frac{7}{13}$ to a decimal.

2. If one ton of coal costs $8.75, how many tons of coal can be bought with $43.75?

3. How many pounds of potatoes must a grocer have in order to supply each of 78 customers with 15 pounds of potatoes?

4. Row No. 6 in our study hall has 24 desks in it. The study hall seats 126 pupils. What per cent of the desks are in Row No. 6?

example reads: "How many halves are there in $\frac{10}{2}$?" The answer is 10.

Take 5 pasteboard squares. Cut each of them into halves. How many halves did you get?

Example (*A*). Divide 10 by $\frac{2}{3}$.

We cannot divide until we make the two numbers alike. We may do this by changing 10 to thirds. $10 = \frac{30}{3}$. 30 thirds $\div$ 2 thirds, or $\frac{30}{3} \div \frac{2}{3}$, $= 30 \div 2 = 15$. That is, $10 \div \frac{2}{3} = 15$.

Example (*B*). Divide 5 by $\frac{3}{5}$.

We have to make both numbers alike, and so we change 5 to fifths. $5 = \frac{25}{5}$. 25 fifths $\div$ 3 fifths, or $\frac{25}{5} \div \frac{3}{5}$, $= 25 \div 3 = 8\frac{1}{3}$. That is, $5 \div \frac{3}{5} = 8\frac{1}{3}$.

1. Arthur Gates worked and saved \$130.00 during vacation. He plans to spend this money for incidentals while he goes to school. If he spends \$2.50 per week, how long will his money last?

2. The regular selling price of a chair was \$9.15, but Mr. Bachelder could not get more than \$7.75 for it. If he sold it for \$7.75, what per cent discount from the selling price did he have to make?

3. How many quarts are there in 46218 pints?

4. What is $\frac{3}{7}$ of \$12.18?

5. What is $\frac{3}{5}$ of \$25.10?

6. What is $\frac{7}{8}$ of \$8.20?

7. How many inches are there in .6 foot?

8. Frank Barnes wants a pair of shoes that cost \$6.75. Frank has \$4.43. How much more money does he need?

Find the quotients:

	(1)	(2)	(3)
(*A*)	$8 \div \frac{3}{4} = ?$	$6 \div \frac{3}{16} = ?$	$24 \div \frac{7}{8} = ?$
(*B*)	$2 \div \frac{1}{4} = ?$	$4 \div \frac{3}{8} = ?$	$9 \div \frac{5}{12} = ?$

Find the missing numbers:

(*C*)	$7 \div \frac{4}{7} = ?$	$8 \div \frac{5}{16} = ?$	$16 \div \frac{3}{4} = ?$
(*D*)	$10 \div \frac{5}{6} = ?$	$22 \div \frac{11}{12} = ?$	$1 \div \frac{5}{6} = ?$

Find the differences:

1	2	3	4	5
\$98.65	\$12.12	\$167.43	\$181.23	\$76.42
28.78	9.00	89.70	99.99	29.99

6. Mr. Olsen sold 288 loaves of bread in $6\frac{1}{2}$ days. What was the average number of loaves sold per day?

7. I can get my magazine for one year for \$4.00, or I can buy it each week at the news stand for 10 cents a copy. What per cent of what I spend at the news stand in a year would I save if I subscribed by the year?

8. How many quarts are there in 6.8 pecks?

9. How many minutes are there in 1.3 hours?

10. How many ounces of butter are there in 7.92 pounds?

11. How many square feet are there in 2.8 square yards?

12. How many square rods are there in .64 acre?

13. The total enrollment in Aurora College was 997. Fifty-five pupils were in the hospital last week. The rest came to classes. What was the per cent of attendance?

14. $3439 \div 7\frac{1}{3} = ?$

The ladies of the Lebanon Church are gathering material for Christmas baskets for the poor. The committee in charge of the Christmas baskets has obtained the following supplies: 10 pounds of fudge, 50 pounds of apples, 60 pounds of oranges, 40 pounds of bananas, and 30 pounds of pop corn.

1. The ladies are putting the fudge into $\frac{1}{4}$-pound bags. How many bags must they fill?

2. They plan to put 3 pounds of apples in each bag. If the apples average $\frac{7}{16}$ pound each, about how many apples should they put in each bag?

3. How many oranges should they put in a 3-pound bag if oranges average $\frac{3}{8}$ pound each?

4. If bananas average $\frac{3}{16}$ pound each, about how many bananas should they put in a bag that is to weigh 2 pounds?

5. If a sack of pop corn weighs $\frac{1}{8}$ pound, how many sacks would be needed to make 2 pounds?

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1. What is the weight of 33.75 bushels of dried peaches if one bushel of the peaches weighs 33 pounds?

2. Don Rogers made a kite string out of some odd pieces of twine. The lengths of the pieces were 27.5 feet, $6\frac{1}{2}$ yards, 15 feet 9 inches, and $4\frac{2}{3}$ yards. How many feet were there in Don's kite string?

3. The list price on a writing desk was \$43.53. The net price was \$32.65. What was the amount of the discount?

4. How many pints are there in 17.9 quarts?

5. How many feet are there in 29.56 inches?

6. How many yards are there in 6.03 feet?

Mixed Numbers

Type I

Example (*A*). How much is $15 \div 2\frac{1}{2}$?

We cannot divide these numbers because they are not alike, but we can change them both to halves.

$$15 = \tfrac{30}{2}. \qquad 2\tfrac{1}{2} = \tfrac{5}{2}.$$

30 halves ÷ 5 halves, or $\tfrac{30}{2} \div \tfrac{5}{2}$, $= 30 \div 5 = 6$.

That is, $15 \div 2\tfrac{1}{2} = 6$.

Example (*B*). Divide 20 by $16\frac{2}{3}$.

We make these numbers alike by changing both of them to thirds. $20 = \tfrac{60}{3}$. $16\tfrac{2}{3} = \tfrac{50}{3}$.

60 thirds ÷ 50 thirds, or $\tfrac{60}{3} \div \tfrac{50}{3}$, $= 60 \div 50 = 1\tfrac{10}{50} = 1\tfrac{1}{5}$.

That is, $20 \div 16\tfrac{2}{3} = 1\tfrac{1}{5}$.

Find the quotients:

	(1)	(2)	(3)
(*A*)	$25 \div 7\frac{1}{2} = ?$	$32 \div 3\frac{1}{5} = ?$	$64 \div 2\frac{2}{7} = ?$
(*B*)	$100 \div 16\frac{2}{3} = ?$	$100 \div 87\frac{1}{2} = ?$	$100 \div 33\frac{1}{3} = ?$
(*C*)	$100 \div 6\frac{1}{4} = ?$	$100 \div 66\frac{2}{3} = ?$	$100 \div 11\frac{1}{9} = ?$
(*D*)	$21 \div 1\frac{3}{4} = ?$	$10 \div 3\frac{1}{3} = ?$	$25 \div 1\frac{1}{4} = ?$

Find the products:

1	2	3	4	5
8.765	$67.20	795.3	2.384	6.792
6.7	54	.879	2.31	59

6. How much is saved by buying spools of thread at 50¢ a dozen instead of paying 5¢ a spool for them?

1. How many pieces of rope each $2\frac{2}{3}$ feet long can be cut from 48 feet of rope?

2. There are 10 yards of ribbon on a roll. How many pieces each $1\frac{2}{3}$ yards long will this make?

3. Sixteen feet is how many times $1\frac{1}{3}$ feet?

4. Twenty-five pounds is how many times $2\frac{1}{2}$ pounds?

5. Twenty-two yards is how many times $5\frac{1}{2}$ yards?

6. One hundred cubic feet is how many times $1\frac{1}{4}$ cubic feet?

Type II

Example (*A*). Divide $6\frac{1}{4}$ by $2\frac{1}{2}$.

We must make the dividend and divisor alike before we can divide. We can do this by changing both numbers to fourths.

$6\frac{1}{4} = \frac{25}{4}$, and $2\frac{1}{2} = \frac{5}{2}$. But $\frac{1}{2} = \frac{2}{4}$; hence, $\frac{5}{2} = \frac{10}{4}$.

25 fourths $\div$ 10 fourths, or $\frac{25}{4} \div \frac{10}{4}, = 25 \div 10 = 2\frac{5}{10} = 2\frac{1}{2}$.

That is, $6\frac{1}{4} \div 2\frac{1}{2} = 2\frac{1}{2}$.

1. Arthur Risk bought a pair of skates for \$3.34. He paid for the skates with a check for \$9.21. How much change should he receive?

2. Caramels are selling at 60 cents a pound. What part of a pound should the clerk sell for a nickel?

3. How many times 8 is 64.4?

4. Mr. Nelson bought 9 dozen strings of beads at 75 cents a string. How many strings of beads must he sell at \$1.25 each to pay the cost of all the beads?

5. How many pints are there in 1.89 quarts?

Example (*B*). Find the quotient when $6\frac{2}{3}$ is divided by $1\frac{1}{12}$. We make these numbers alike by changing both of them to twelfths.

$$6\tfrac{2}{3} = \tfrac{20}{3}.$$

But $\frac{1}{3} = \frac{4}{12}$; hence, $\frac{20}{3} = \frac{80}{12}$.

$$1\tfrac{1}{12} = \tfrac{13}{12}.$$

80 twelfths ÷ 13 twelfths, or $\frac{80}{12} \div \frac{13}{12}$, $= 80 \div 13 = 6\frac{2}{13}$.

That is, $6\frac{2}{3} \div 1\frac{1}{12} = 6\frac{2}{13}$.

Find the quotients:

	(1)	(2)	(3)
(*A*)	$3\frac{1}{3} \div \frac{5}{6} = ?$	$16\frac{1}{2} \div 1\frac{3}{8} = ?$	$15\frac{3}{8} \div 10\frac{1}{4} = ?$
(*B*)	$12\frac{3}{16} \div 3\frac{1}{8} = ?$	$18\frac{3}{4} \div 2\frac{1}{12} = ?$	$67\frac{1}{2} \div 6\frac{3}{4} = ?$
(*C*)	$10\frac{5}{12} \div 1\frac{2}{3} = ?$	$66\frac{2}{3} \div 1\frac{1}{9} = ?$	$81\frac{1}{4} \div 3\frac{1}{8} = ?$
(*D*)	$7\frac{5}{12} \div 1\frac{1}{6} = ?$	$17\frac{7}{8} \div 2\frac{1}{4} = ?$	$29\frac{2}{3} \div 7\frac{5}{12} = ?$

1. A stick of stove wood is about $1\frac{1}{6}$ feet long. How many $1\frac{1}{6}$-foot lengths can be sawed from a pole $19\frac{1}{2}$ feet long? What remainder will there be?

Find the differences:

1	2	3	4	5	6
.90	$9.10	$8.00	$9.21	.64	$15.74
.66	6.45	4.68	1.76	.19	9.96

7. How much is 95×843?

8. How many quarts are there in .48 gallon?

9. What is $\frac{2}{9}$ of 4042.8?

10. Mr. Cates has 9072 peach trees to set out. He wishes to put 108 trees in a row. How many rows must he make?

2. There are $30\frac{1}{4}$ square yards in one square rod. How many square rods will there be in $140\frac{1}{2}$ square yards?

3. There are $5\frac{1}{2}$ yards in one rod. How many rods will there be in $40\frac{1}{4}$ yards?

4. Five and a half hours is how many times $1\frac{3}{4}$ hours?

Type III

Example. What is the quotient when $7\frac{1}{2}$ is divided by $1\frac{2}{3}$?

We cannot divide these numbers as they stand because they are not alike. We cannot change halves to thirds or thirds to halves, but we can change both numbers to sixths.

$7\frac{1}{2} = \frac{15}{2}$, but $\frac{1}{2} = \frac{3}{6}$; hence, $\frac{15}{2} = \frac{45}{6}$.

$1\frac{2}{3} = \frac{5}{3}$, but $\frac{1}{3} = \frac{2}{6}$; hence, $\frac{5}{3} = \frac{10}{6}$.

45 sixths ÷ 10 sixths, or $\frac{45}{6} \div \frac{10}{6}$, $= 45 \div 10 = 4\frac{5}{10} = 4\frac{1}{2}$.

Find the quotients:

	(1)	(2)	(3)
(*A*)	$30\frac{1}{4} \div 5\frac{1}{3} = ?$	$9\frac{5}{12} \div 1\frac{7}{8} = ?$	$16\frac{1}{3} \div 2\frac{1}{4} = ?$
(*B*)	$5\frac{1}{2} \div 1\frac{1}{3} = ?$	$9\frac{1}{6} \div 2\frac{3}{4} = ?$	$2\frac{1}{16} \div \frac{2}{3} = ?$
(*C*)	$33\frac{1}{3} \div 6\frac{1}{4} = ?$	$30\frac{1}{4} \div 1\frac{5}{6} = ?$	$11\frac{1}{4} \div 3\frac{1}{3} = ?$
(*D*)	$18\frac{3}{4} \div 8\frac{1}{3} = ?$	$16\frac{2}{3} \div 12\frac{1}{2} = ?$	$67\frac{1}{2} \div 33\frac{1}{3} = ?$

1. A single grapefruit weighs about $\frac{7}{8}$ pound. How many grapefruit would you expect to get in a bag of grapefruit weighing $5\frac{1}{3}$ pounds?

2. An apple weighs about $\frac{7}{16}$ pound. About how many apples would there be in a bushel weighing $49\frac{1}{4}$ pounds?

3. How many badges $\frac{7}{12}$ foot long can be cut from a piece of ribbon $8\frac{3}{4}$ feet long?

"What Part Of" Exercises with Fractions

Type I

Example. What part of 4 is $1\frac{1}{3}$?

In "what part of" exercises we put the larger number underneath and the smaller number on top. In this case we get $\frac{1\frac{1}{3}}{4}$. Such an expression is called a complex fraction. This is the right answer, but we must always change complex fractions to simple fractions when they occur in an answer. We do this by dividing the numerator by the denominator. Remember that the numerator is the top number. The denominator is the bottom number. We cannot divide until the numbers are made alike. That is why we must change the 4 into thirds and the $1\frac{1}{3}$ into thirds.

$1\frac{1}{3} = \frac{4}{3}$, and $4 = \frac{12}{3}$.

4 thirds ÷ 12 thirds = $\frac{4}{12}$, or $\frac{1}{3}$.

That is, $1\frac{1}{3}$ is $\frac{1}{3}$ of 4.

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1. What part of 644 is 84?
2. Mary Woods is just 12 years old. Her little sister Jane is just $2\frac{7}{12}$ years old. How much older is Mary than Jane?
3. How many feet are there in .7 yard?
4. 13724 ÷ 96 = ?
5. \$667 + \$300 = ?
6. The Martin and Nelson Dairy has just bought 27,000 quart bottles. How many gallons of milk will these bottles hold?
7. How many pounds are there in 59.2 ounces?

Find what part the smaller number is of the larger in each case:

	(1)	(2)	(3)
(*A*)	$1\frac{2}{3}$, 10	$2\frac{1}{4}$, 36	$5\frac{1}{2}$, 22
(*B*)	$3\frac{1}{3}$, 30	$16\frac{2}{3}$, 100	$66\frac{2}{3}$, 250
(*C*)	100, $37\frac{1}{2}$	100, $8\frac{1}{3}$	100, $11\frac{1}{9}$
(*D*)	100, $62\frac{1}{2}$	100, $33\frac{1}{3}$	100, $6\frac{1}{4}$

1. What part of 55 yards are $5\frac{1}{2}$ yards?
2. What part of 1995 square yards are $30\frac{1}{4}$ square yards?
3. What part of a dollar are $87\frac{1}{2}$ cents?
4. What part of 7 feet are $1\frac{3}{4}$ feet?

Find the products:

1	2	3	4	5
578.42	64.892	87.43	596.2	74.382
6.07	13.5	.89	7.8	8.9

6. Find the total cost of the following groceries that were used in preparing a luncheon for thirty people:

4 lb. ham at 25¢ per pound
$\frac{1}{2}$ pk. potatoes at 28¢ per peck
1 small head cabbage at 5¢
4 heads lettuce at $12\frac{1}{2}$¢ each
2 loaves bran bread at 15¢ each
1 loaf whole wheat bread at 16¢
$1\frac{1}{2}$ lb. butter at 55¢ per pound
$4\frac{1}{2}$ cups flour for raisin cake at $1\frac{1}{9}$¢ each
$2\frac{1}{4}$ lb. sugar at 4¢ per pound
2 cups raisins at $3\frac{1}{2}$¢ per cup
Egg, soda, and milk at 10¢

7. What was the cost of this luncheon per person?

Type II

Example. What part of $7\frac{1}{2}$ is $1\frac{1}{4}$?

We place the smaller number above the larger one and obtain $\frac{1\frac{1}{4}}{7\frac{1}{2}}$. This is a complex fraction, but we can change it to a simple fraction by dividing the numerator by the denominator. We make the numbers alike by changing both into fourths.

$1\frac{1}{4} = \frac{5}{4}$, and $7\frac{1}{2} = \frac{15}{2} = \frac{30}{4}$.

5 fourths ÷ 30 fourths $= \frac{5}{30}$, or $\frac{1}{6}$.

That is, $1\frac{1}{4}$ is $\frac{1}{6}$ of $7\frac{1}{2}$.

Find what part the smaller number is of the larger in each case:

	(1)	(2)	(3)
(*A*)	$1\frac{2}{3}$, $2\frac{11}{12}$	$2\frac{3}{4}$, $6\frac{3}{16}$	$2\frac{1}{2}$, $18\frac{3}{4}$
(*B*)	$3\frac{1}{3}$, $4\frac{1}{6}$	$1\frac{7}{8}$, $22\frac{1}{2}$	$1\frac{5}{12}$, $11\frac{1}{3}$
(*C*)	$37\frac{1}{2}$, $3\frac{3}{4}$	$\frac{1}{6}$, $\frac{1}{12}$	$\frac{2}{3}$, $\frac{5}{6}$
(*D*)	$\frac{1}{4}$, $\frac{3}{16}$	$\frac{7}{8}$, $1\frac{1}{2}$	$\frac{3}{4}$, $1\frac{7}{8}$

1. What is $5\frac{1}{2}$ per cent of \$400?

2. What is the rate per hour when an airplane flies 703.2 miles in $8\frac{1}{4}$ hours?

3. The net price is 75 per cent of the list price. What is the per cent of discount?

4. Find the cost of 39 typewriters at \$57.98 each.

5. Mrs. Arnold baked 5 dozen cookies at a cost of 1 cent each. She sold them all for \$1.00. How much did Mrs. Arnold receive for her labor and time?

1. Mr. Olsen had $25\frac{1}{2}$ bushels of apples in his cellar. Before he could use them some of the apples rotted. After he had picked out the rotten ones, he had $18\frac{3}{4}$ bushels left. What part of his apples had spoiled?

2. Mr. Jones sells sugar. Last Saturday morning before he opened his store, he had on hand $115\frac{3}{4}$ pounds of sugar. By Saturday night he had sold all but $25\frac{7}{8}$ pounds. What part of the sugar did he sell on Saturday?

3. Our coal bin will hold $8\frac{3}{4}$ tons of coal. It now has $2\frac{1}{2}$ tons in it. What part of the bin is filled?

Find the totals:

1	2	3	4	5
$89.61	$98.78	$87.88	$97.80	$41.44
28.99	44.18	97.07	95.89	78.89
54.03	45.67	62.14	20.02	80.61
52.92	52.93	36.72	42.17	11.05
21.39	24.72	43.76	14.34	54.75
54.09	68.58	32.27	55.68	7.90
12.30	62.50	20.50	44.22	68.06
43.22	3.11	1.91	19.55	34.27

6. We lost or tied 20 per cent of our games last season. What per cent of them did we win?

7. What is the area of a field which is $25\frac{1}{3}$ yards long and $18\frac{2}{3}$ yards wide?

8. Our cow Mollie gives a pail of milk each day. The pail holds $2\frac{1}{2}$ gallons. We put the milk in pint bottles. How many of these bottles do we need each day?

9. Mrs. Bates bought $8\frac{3}{4}$ yards of velvet for $42.00. What did the velvet cost per yard?

Type III

Example. What part of $1\frac{2}{3}$ is $\frac{3}{4}$?

We can make a complex fraction out of these numbers thus, $\frac{\frac{3}{4}}{1\frac{2}{3}}$. We cannot simplify this fraction until the upper and lower numbers are alike. We can make them alike by changing both numbers into twelfths.

$\frac{3}{4} = \frac{9}{12}$, and $1\frac{2}{3} = \frac{5}{3}$.

But $\frac{1}{3} = \frac{4}{12}$; hence, $\frac{5}{3} = \frac{20}{12}$.

9 twelfths ÷ 20 twelfths $= \frac{9}{20}$.

That is, $\frac{3}{4}$ is $\frac{9}{20}$ of $1\frac{2}{3}$.

Find what part the smaller number is of the larger number in Rows (*A*) and (*B*). Be sure that you know which number is larger before you begin. Small denominators often mean large fractions. If you get more than one for your answer, you will know that you have used the larger number where you should have used the smaller.

	(1)	(2)	(3)	(4)
(*A*)	$\frac{1}{3}$, $\frac{1}{2}$	$\frac{1}{3}$, $\frac{1}{4}$	$\frac{2}{3}$, $\frac{3}{4}$	$\frac{1}{6}$, $\frac{7}{16}$
(*B*)	$\frac{1}{2}$, $\frac{2}{3}$	$\frac{1}{6}$, $\frac{3}{8}$	$\frac{5}{12}$, $\frac{3}{8}$	$\frac{2}{3}$, $\frac{7}{8}$

	(5)	(6)
(*C*)	$\frac{5}{6} \times ? = \frac{3}{4}$	$\frac{1}{12} \times ? = \frac{1}{16}$
(*D*)	$2\frac{1}{2} \times ? = 1\frac{1}{3}$	$2\frac{1}{3} \times ? = 1\frac{3}{4}$

1. $6\frac{1}{4}$ pounds are what part of $8\frac{1}{3}$ pounds?
2. $16\frac{2}{3}$ bushels are what part of $37\frac{1}{2}$ bushels?
3. $83\frac{1}{3}$ cents are what part of $93\frac{3}{4}$ cents?
4. $3\frac{3}{4}$ hours are what part of $5\frac{1}{4}$ hours?

Problems in Division with Fractions and Mixed Numbers

1. How many rods are there in 99 feet?

2. Change 121 square yards to square rods.

3. $17\frac{1}{2}$ is how many times $2\frac{1}{2}$?

4. At $16\frac{2}{3}$ cents a yard, how many yards of cloth can you buy for $5.00?

5. Arthur Smith walked $6\frac{1}{4}$ miles in $1\frac{2}{3}$ hours. What was his rate per hour?

6. James Miller can plow $2\frac{3}{4}$ acres in one day. At that rate, how many days will it take him to finish plowing a field containing 22 acres?

7. If it takes $3\frac{3}{4}$ yards of cloth to make one dress, how many dresses can be made out of 30 yards of cloth?

8. If a bushel of wheat occupies $1\frac{1}{4}$ cubic feet, how many bushels can be put in a bin which contains 600 cubic feet?

9. How many barrels each holding $31\frac{1}{2}$ gallons will be needed to hold 495 gallons of water?

Find the quotients:

	(1)	(2)	(3)	(4)
(*A*)	$5\overline{)251.53}$	$8\overline{)51.008}$	$6\overline{)6100.854}$	$3\overline{)10.1076}$
(*B*)	$2\overline{)18406.2}$	$6\overline{)11.3442}$	$2\overline{)12.1416}$	$3\overline{)24.183}$

1. Find the volume of a treasure chest which is $1\frac{1}{2}$ feet high, $3\frac{1}{6}$ feet long, and $1\frac{2}{3}$ feet wide.

2. John Baker weighs $197\frac{1}{8}$ pounds. James Hull weighs $160\frac{3}{4}$ pounds. Which is heavier? How much heavier?

10. We are going to have a new schoolhouse. In order to have a basement, it will be necessary to remove 117 cubic yards of dirt. If $\frac{3}{4}$ cubic yard of dirt is a wagon-load, how many loads will there be in all?

A Short Method of Division with Fractions and Mixed Numbers

Example (*A*). Divide $9\frac{1}{2}$ by $4\frac{1}{3}$.

$9\frac{1}{2} = \frac{19}{2}$, and $4\frac{1}{3} = \frac{13}{3}$.

$\frac{19}{2} \div \frac{13}{3} = \frac{19}{2} \times \frac{3}{13} = \frac{57}{26}$.

$\frac{57}{26} = 2\frac{5}{26}$.

Example (*B*). Find the quotient of $7\frac{1}{3} \div 1\frac{5}{6}$.

$7\frac{1}{3} = \frac{22}{3}$, and $1\frac{5}{6} = \frac{11}{6}$.

$$\frac{22}{3} \div \frac{11}{6} = \frac{\overset{2}{\cancel{22}}}{\cancel{3}} \times \frac{\overset{2}{\cancel{6}}}{\cancel{11}} = 4.$$

Example (*C*). $1\frac{7}{8}$ is what part of 5?

$1\frac{7}{8} = \frac{15}{8}$.

$$\frac{15}{8} \div 5 = \frac{\overset{3}{\cancel{15}}}{8} \times \frac{1}{\cancel{5}} = \frac{3}{8}.$$

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1. What is the commission at 6 per cent on a sale of $900?

2. The sixth grade gave a box of toys to the children at the Children's Home last Christmas. This is what they gave: 24 toys worth 29 cents each on the average; 1 large doll worth $2.98; 6 small dolls worth 19 cents each. What was the total value of their gifts?

3. How many sandwiches are needed to give 3 sandwiches to each of 326 people?

Example (*D*). What part of $12\frac{1}{2}$ is $2\frac{1}{2}$?

$12\frac{1}{2} = \frac{25}{2}$, and $2\frac{1}{2} = \frac{5}{2}$.

$$\frac{5}{2} \div \frac{25}{2} = \frac{\cancel{5}}{\cancel{2}} \times \frac{\cancel{2}}{\cancel{25}_{5}} = \frac{1}{5}.$$

Note that when each number above the line is canceled you are to write 1 for the numerator of the answer.

Study these three examples and see if you can find just one thing which was done in each of them that has not been done in any of the examples and problems that you have had before. Can you tell what the new thing is?

In each case we turned the divisor over and multiplied. This can always be done in dividing fractions and mixed numbers. When we turn a number over, we say that we have **inverted** it. To use the short method, you change both numbers to improper fractions if necessary. Then you invert the divisor and multiply. You must be very careful not to invert the wrong number. If you do, your answer will be upside down. Such answers are, of course, always wrong.

Find the differences:

1	2	3	4	5
\$6.14	1.576	.1533	872.3	13.89
2.47	.988	.0679	124.6	4.00

6. One bushel of potatoes weighs 60 pounds. What is the weight of 67.92 bushels?

7. The list price of a chair was \$8.31. The amount of the discount was \$1.67. What was the net price?

Work out the following exercises. Be sure that you know which number to invert before you begin.

Find the quotients:

	(1)	(2)	(3)
(*A*)	$\frac{2}{9} \div \frac{2}{3} = ?$	$16\frac{2}{3} \div 6\frac{1}{4} = ?$	$3\frac{1}{3} \div \frac{9}{10} = ?$
(*B*)	$1\frac{5}{6} \div \frac{2}{11} = ?$	$\frac{5}{8} \div 1\frac{2}{3} = ?$	$\frac{7}{8} \div 1\frac{2}{5} = ?$
(*C*)	$\frac{2}{3} \div \frac{1}{4} = ?$	$3\frac{1}{7} \div \frac{1}{8} = ?$	$33\frac{1}{3} \div 3\frac{1}{3} = ?$
(*D*)	$2\frac{8}{9} \div \frac{1}{7} = ?$	$4\frac{1}{6} \div \frac{3}{5} = ?$	$6\frac{1}{4} \div 37\frac{1}{2} = ?$
(*E*)	$160\frac{1}{3} \div 1\frac{1}{9} = ?$	$24\frac{1}{2} \div 7 = ?$	$30\frac{1}{4} \div 5\frac{1}{2} = ?$

1. What part of $4\frac{1}{6}$ is $1\frac{2}{3}$? 3. What part of $66\frac{2}{3}$ is $16\frac{2}{3}$?

2. What part of 20 is $3\frac{1}{3}$? 4. What part of $\frac{1}{12}$ is $\frac{1}{3}$?

5. What part of $\frac{5}{6}$ is $2\frac{1}{12}$?

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1. The Mississippi River is 2430 miles long. Wild ducks fly at the rate of 60 miles per hour. How long will it take a flock of ducks at this rate to fly from the head of the river to its mouth?

2. How far will a train go in 15 hours at an average rate of 38.7 miles per hour?

3. How many pints are there in 97.6 quarts?

4. Bob Acres bought a bicycle for $45.00 and had to sell it for $33\frac{1}{3}$ per cent less than it cost him. How much did Bob get for his bicycle?

5. Mr. Brown bought 12 dozen eggs. He found that 36 eggs were broken. What per cent of the eggs were broken?

CHAPTER VIII

DECIMAL FRACTIONS AND HOW TO USE THEM

You have learned that fractions or mixed numbers cannot be added or subtracted unless they are alike. That is, they must have the same numbers for denominators. In division with fractions and mixed numbers it is usually better to change them so that they will have the same numbers for denominators. About three hundred years ago someone thought of a plan to reduce all fractions to fractions having 10, 100, 1000, or 10,000 for their denominators. In fractions of this sort it is not necessary to write the denominator. This saves much time and makes examples and problems in fractions very much easier to solve. Fractions of this sort are called **decimal fractions.** In order to read, write, and understand decimal fractions, there are a few things which you must learn and remember.

Important Facts about Decimal Fractions

1. We use a dot or point in front of the fraction to show that we mean to write a fraction and not a whole number. This is necessary because we do not intend to write the denominator or draw the line. This dot is called **a decimal point.**

2. If there is one figure after the decimal point the fraction is tenths. Thus .1, .4, .9 mean $\frac{1}{10}$, $\frac{4}{10}$, $\frac{9}{10}$, respectively.

3. If there are two figures after the decimal point, the fraction is hundredths. Thus .02, .25, .90 mean $\frac{2}{100}$, $\frac{25}{100}$, $\frac{90}{100}$, respectively.

4. If there are three figures after the decimal point, the fraction is thousandths. Thus .003, .025, .725 mean $\frac{3}{1000}$, $\frac{25}{1000}$, and $\frac{725}{1000}$, respectively.

5. If there are four figures after the decimal point, the fraction is in ten thousandths. Thus .0004, .0075, .0625, and .3125 mean $\frac{4}{10000}$, $\frac{75}{10000}$, $\frac{625}{10000}$, and $\frac{3125}{10000}$, respectively.

What would the fraction be if there were five figures after the decimal point? Almost any number of figures may be written after the decimal point, but we shall not use more than five figures in this book.

Three Things to Watch

There are only three common mistakes that children make with decimal fractions. They are the following.

1. Some children forget to put in the decimal point.

2. Some put it in the wrong place.

3. Some neglect to write zeros just after the decimal point when it is necessary to show what the denominator really is.

Thus:

.2 means $\frac{2}{10}$ .003 means $\frac{3}{1000}$

.3 means $\frac{3}{10}$ .025 means $\frac{25}{1000}$

.02 means $\frac{2}{100}$ .0004 means $\frac{4}{10000}$

.25 means $\frac{25}{100}$ .0075 means $\frac{75}{10000}$

.0625 means $\frac{625}{10000}$

a. What does .4 mean?
b. What does .75 mean?
c. What does .625 mean?
d. What does .005 mean?
e. What does .0001 mean?
f. What does .09 mean?
g. What does .025 mean?
h. What does .00625 mean?

Changing Common Fractions to Decimal Fractions

It nearly always makes your problem or example in common fractions easier if you change the common fractions to decimal fractions. This can always be done. Here is the way to do it.

Example (*A*). Change $\frac{4}{5}$ to a decimal fraction.

$$5\overline{)4.0}\quad .8$$

Therefore $\frac{4}{5} = .8$.

Find the sums:

1	2	3	4
$31.20	$44.32	$99.68	$78.93
67.87	40.72	65.66	96.54
15.33	46.64	68.79	98.39
86.98	89.99	15.37	33.90
80.47	10.40	87.60	6.58
38.00	75.15	60.65	4.05
37.71	89.06	1.01	1.16
.09	1.77	.30	.12

5. Ruth Sargent and Mary Barnes estimated the height of Pansy Cook. Ruth thought Pansy was $4\frac{3}{4}$ feet tall. Mary thought Pansy was $5\frac{1}{2}$ feet tall. Pansy's correct height was $5\frac{1}{3}$ feet. Which girl made the better estimate, Ruth or Mary? How much better?

Example (*B*). Change $\frac{1}{16}$ to a decimal fraction.

$$
\begin{array}{r}
.0625 \\
16\overline{)1.0000} \\
\underline{96} \\
40 \\
\underline{32} \\
80 \\
\underline{80}
\end{array}
$$

Therefore $\frac{1}{16} = .0625$.

Study these two examples. Notice that you divide the numerator by the denominator. But before you do so you put a decimal point after the numerator and add zeros after the decimal point. You keep adding zeros until the answer comes out even or as far as you are told. Sometimes you are told to "carry the answer out four places." This means that you are to add four zeros to the numerator before you divide. You must know **where to put the decimal point in the answer.**

Put the decimal point just in front of your answer. Don't forget it! You must also know **when to put zeros after the decimal point.** There must always be as many figures in your answer as you have zeros in the numerator which you divide. For every zero that you put in the numerator you must have a figure in the answer. Thus, in the answer to Example (*B*) we put a zero after the point because we had used four zeros in the numerator; otherwise the answer would have had only three figures in it. Always put the zeros just after the decimal point when you need them. If the answer does not come out even, do just as you did in the division of whole numbers.

Change the following fractions to decimal fractions. Do not extend your answers beyond four places.

	(1)	(2)	(3)	(4)	(5)
(*A*)	$\frac{1}{2}$	$\frac{1}{6}$	$\frac{7}{8}$	$\frac{1}{4}$	$\frac{2}{3}$
(*B*)	$\frac{1}{12}$	$\frac{7}{16}$	$\frac{3}{4}$	$\frac{1}{5}$	$\frac{1}{25}$
(*C*)	$\frac{1}{33}$	$\frac{1}{64}$	$\frac{1}{50}$	$\frac{1}{75}$	$\frac{1}{24}$

Practice Exercises

Find the quotients:

	(1)	(2)	(3)	(4)
(*A*)	$9\overline{)320.211}$	$4\overline{)100.368}$	$7\overline{)55.0123}$	$8\overline{)311122.4}$
(*B*)	$9\overline{)411.012}$	$7\overline{)539.14}$	$4\overline{)283.00}$	$5\overline{)3440.45}$

1. A tourist traveled 24435 miles in $9\frac{2}{3}$ months. What was his average rate per month?

2. How many quarts are there in 520.9 gallons?

3. A grocer buys flour at $1.00 a bag and sells it at $1.25 per bag. What is his per cent of margin?

4. Tom Busby had $3.10 when he went to the circus. When he came home he had only $1.03. How much did Tom spend or lose?

5. Change $\frac{2}{15}$ to a decimal.

6. $12\frac{1}{2}$ is what part of $18\frac{3}{4}$?

7. How many feet are there in .2 mile?

8. John Mansur had $300 last year. He used his money in trading, and had $320 one year later. What per cent of increase had there been in John's money?

9. The school enrollment is 77. The number present today is 75. Has the school a 99 per cent attendance? Prove your answer.

10. How many yards are there in 3.12 feet?

11. How many feet are there in 15.6 inches?

12. At 50 cents for each present, how many Christmas presents will $10.50 buy?

13. A large building is 528 feet high. What part of a mile is that?

14. Bob Samson raises pop corn and sells it. He sold $1\frac{3}{4}$ bushels to his aunt, $\frac{1}{2}$ peck to his cousin, and $12\frac{1}{2}$ bushels to the grocer. How many bushels did Bob sell in all?

15. What per cent means the same as $\frac{1}{8}$?

16. This is Betty Groves's record of hours slept for one week: Monday, 10 hours; Tuesday, $9\frac{3}{4}$ hours; Wednesday, $9\frac{1}{4}$ hours; Thursday, $9\frac{5}{6}$ hours; Friday, $10\frac{1}{6}$ hours; Saturday, $8\frac{3}{4}$ hours; Sunday, $9\frac{1}{2}$ hours. How many hours did Betty sleep that week? What was her average number of hours per night?

17. How many quarts are there in 7.84 pecks?

18. How many feet are there in .4 mile?

Adding Decimals

Example (*A*). Find the sum of .5, .125, .1416, and .25.

We cannot add these as they stand because they are not alike. We can make them alike by changing the first, second, and fourth to ten thousandths.

$.5 = .5000, \qquad .125 = .1250, \qquad .25 = .2500.$

Now we can write the fractions in column form and add.

$$\begin{array}{r} .5000 \\ .1250 \\ .1416 \\ .2500 \\ \hline 1.0166 \end{array} \quad \textit{Ans.}$$

Example (*B*). Find the sum of 7.0625, 5, 1.666, 7.8, and .75.

We make these numbers alike by changing the fractions to ten thousandths. Then we add.

$$\begin{array}{rcr} 7.0625 & = & 7.0625 \\ 5. & = & 5.0000 \\ 1.666 & = & 1.6660 \\ 7.8 & = & 7.8000 \\ .75 & = & .7500 \\ & & \overline{22.2785} \end{array} \quad \textit{Ans.}$$

Study these two examples. Here is a short way to remember what to do.

1. Write the numbers to be added with their *decimal points* in a straight row up and down. If there are any whole numbers to be added, the decimal points will come just after the whole numbers.

2. Fill in all gaps on the right-hand side with zeros, so that the right-hand edge will be even.

3. Then add as in whole numbers.

4. Put a decimal point in the answer just in line with the decimal points above.

Find the sums of the following decimal fractions. Be sure that the points are in a straight line before you add.

(*A*) .066, 13.75, 8, 10, .0175, and .1.

(*B*) 1250, .125, .0125, 12.5, and 1.25.

(*C*) .2, .003, .0007, .08, and 9.

(*D*) 18.725, 9.7, 20.02, 15, and .3125.

(*E*) 150, 75, .075, 62.5, and .25.

(*F*) .1666, .142, .33, .9, and 100.

Subtracting Decimals

You have learned that the smaller number is to be written under the larger before you subtract. This is true in decimal fractions, but some pupils get wrong answers because they do not know which the smaller number is.

Find the differences:

	(1)	(2)	(3)	(4)	(5)
(*A*)	\$16.31	\$11.24	\$11.21	14.234	1894.2
	5.44	1.25	8.33	9.900	998.0
(*B*)	1.349	.280	9.42	71.0	1.110
	.998	.279	8.87	21.3	.235

1. A grocer's scales weighed 18 ounces to the pound. In selling 352 pounds of sugar, how many pounds would he really give away?

Example. Which is smaller, .2 or .125?

You may not be able to tell for certain because the numbers are not alike. One is tenths and the other is thousandths. We can make them alike by changing .2 to thousandths: .2 = .200, and .125 is smaller than .200.

Do the following exercises in the same way, telling which of the two numbers in each exercise is the smaller:

	(1)	(2)	(3)
(*A*)	.01 or .1	1 or .0625	36.5 or .666
(*B*)	.3125 or 6	65.75 or .7825	.999 or 100
(*C*)	10 or 6.5	4 or .50	2.75 or 10
(*D*)	100 or 49.5	.96 or 60	.2 or 1.8
(*E*)	.45 or .275	4 or .6725	.8975 or 1
(*F*)	.26 or 19	7 or .982	.56 or .671
(*G*)	.875 or 2.31	1.88 or 2.03	3.15 or 5.1

Review the exercises above and find the difference between each pair of numbers.

1. Stony Point is on the road from Gays Mills to Lone Rock. Mr. Jones is on his way from Stony Point to Lone Rock. The whole distance is 6 miles. He has arrived at Gays Mills and his speedometer registers .8 mile from Stony Point. How much farther must he go in order to arrive at Lone Rock?

2. Alice Carson wishes to buy a beaded bag for her mother's Christmas present. The bag costs 5 dollars. Alice has $3.50. How much more must she earn before she can pay for the beaded bag?

3. Thomas Carter had a 10-dollar bill when he went down town. When he returned home he had only 65 cents. He had spent the rest. How much did he spend?

4. Mary Smith bought 25 cents' worth of candy. She paid for it with a 2-dollar bill. How much change should she receive?

5. James Larson and John Allen estimated the distance from John's home to the village. James's estimate was 3 miles. John's was 2.5 miles. The speedometer on an automobile showed the distance to be 2.8 miles. Which boy's estimate was closer to the true distance? How much closer?

6. Mr. Jones has a margin of 20 per cent on his business. Mr. Smith's margin is 18.5 per cent. Which man makes more margin? How much more?

7. By the railroad time-table it is 91 miles from Chicago to Beloit and 78.5 miles from Chicago to Caledonia. Which is farther from Chicago, Beloit or Caledonia? How much farther is it?

Find the answers:

(1)	(2)	(3)
(*A*) $7\overline{)283122}$	$1010.06 \div 9 = ?$	$? \times 4 = 2912.32$
(*B*) $\frac{1}{3}$ of $24.0915 = ?$	$9 \times ? = 225.504$	$501.416 \div 8 = ?$
(*C*) $7\overline{)61.0267}$	$\frac{1}{9}$ of $220.356 = ?$	$\frac{64}{8} = ?$

1. Mrs. Norton bought $2\frac{3}{4}$ pounds of butter at 56 cents per pound. She paid with a 2-dollar bill. How much change should she receive?

8. Grace Simpson earns $25 a week. Kate Anderson earns $22.80. Which girl earns more? How much more?

9. Moberly is 129 miles from Kansas City and Norborne is 56.5 miles. Which town is farther from Kansas City? How much farther?

10. George Davis bought 2 tablets at 8 cents each and a book for 50 cents. He paid with a 5-dollar bill. How much change should he receive?

Multiplying Decimals

Example. How much is 3.5 times 6.25?

$$\begin{array}{r} 6.25 \\ 3.5 \\ \hline 3125 \\ 1875 \\ \hline 21.875 \end{array}$$

We multiply just as we did with whole numbers. Then we count the number of decimal places in both multiplier

---

1. Which is cheaper, a blouse marked $4.00 with 20 per cent discount, or one marked $4.50 with a 25 per cent discount? How much cheaper?

2. What is $\frac{1}{12}$ of 10.8?

3. Mrs. Carter drove her car 700 miles in $24\frac{3}{4}$ hours of driving time. How fast did she go per hour on the average?

4. What part of a foot is 10 inches?

5. A dress which was offered for sale at $26.25 is now on sale at $19.25. What per cent reduction has been made in the price of the dress?

and multiplicand and point off as many figures as that in the product. The number of figures to the right of the decimal point is usually spoken of as the number of decimal places. Here is a rule that you must memorize.

> The number of decimal places in the product is equal to the number of decimal places in both multiplier and multiplicand taken together.

When you do the following exercises, be sure to put the decimal point at the right place in your answer.

Find the products:

	(1)	(2)	(3)
(*A*)	$10 \times .06 = ?$	$90 \times 1.25 = ?$	$100 \times .01 = ?$
(*B*)	$75 \times .33\frac{1}{3} = ?$	$.05 \times .06 = ?$	$.1 \times .1 = ?$
(*C*)	$.08 \times .125 = ?$	$150 \times .625 = ?$	$.2 \times .2 = ?$
(*D*)	$.5 \times .5 = ?$	$37.5 \times 2.25 = ?$	$25.6 \times .0625 = ?$

1. A train averages 28.5 miles per hour. How far will it go at that rate in 8.5 hours?

2. Find the cost of 15.5 yards of cheesecloth at 7.5 cents a yard.

3. How many gallons are there in 30.25 cubic feet of water if a cubic foot is equivalent to 7.5 gallons?

4. How many square miles are there in a tract of land 4.5 miles long and 2.5 miles wide?

5. How many feet are there in 16 rods if one rod equals 16.5 feet?

From time to time on the pages that follow you will notice the names of some new measures. These measures are used in every country in the world except Great Britain and the United States. In France, for example, when boys run races they measure the distance in what they call **meters.**

6. There are 39.37 inches in one meter. How many inches are there in 50 meters?

7. How many cubic inches are there in a piece of lumber which is 120.5 inches long, 2.75 inches wide, and 1.25 inches thick?

8. Mr. Adams has a tank 7.75 feet long, 2.5 feet wide, and 1.75 feet deep. How many cubic feet of water will the tank hold?

9. If one bushel occupies 1.24 cubic feet, how many cubic feet of space will be required for 100 bushels?

10. Mr. Hogan has 300 bushels of wheat. He wishes to build a bin to hold the wheat. He plans to allow 1.24 cubic feet for each bushel of wheat. Will a bin $5' \times 8' \times 9'$ be large enough? Prove your answer.

11. Ice weighs about 56.25 pounds per cubic foot. What is the weight of a cubic yard of ice?

12. If one pound of coal occupies .011 cubic foot of space, how much space will be needed for 5 tons of coal?

13. The distance through the earth is 7918.5 miles. The distance around it is 3.1416 times the distance through. How far is it around the earth?

14. Five people are going camping for 10 days. The amount of food required for one person each day is as follows: flour, 1.6 pounds; bacon, .58 pound; coffee, .09 pound; salt, .0375 pound; sugar, .1125 pound. How many pounds of each article should the 5 people take for their 10-day camp?

15. How many cubic feet of space are there in a freight car $36' \times 8.5' \times 6'$?

16. Distances on the sea are measured in **knots.** If one knot equals 1.151 miles, how many miles does a ship sail in going 25 knots?

17. In many countries people measure beans, meal, and the like in liters instead of quarts. One quart equals 1.0567 liters. How many liters are there in 15 quarts?

18. A perch of masonry measures $16.5' \times 1.5' \times 1'$. How many cubic feet are there in a perch?

19. Chicken wire 6 feet high costs 8.5 cents per foot. How much would it cost per rod?

20. If 3.375 yards of cloth are needed to make one dress, how much will be needed for 6 such dresses?

21. If it costs 23.4 cents to haul one ton one mile, what is the cost of hauling 2 tons 20 miles?

22. In 1923 a Curtiss airplane flew 392.15 kilometers in one hour. How many miles was this if one kilometer equals .621 mile?

23. The total enrollment of Aurora College was 997. Fifty-five pupils were in the hospital last week. The rest came to classes. What was the per cent of attendance?

A Short Method of Multiplying by 10, 100, 1000, and 10000

Example (*A*). $10000 \times .625 = ?$

$$10000 \times .625 = 6250.000 = 6250$$

Compare .625 with 6250. The decimal point has been moved four places to the right, and there are just four zeros in 10,000.

Example (*B*). How much is 1000×75?

The answer is 75,000. This time there are three zeros in the multiplier and we have moved the decimal point (which is understood after 75) three places to the right, getting 75,000 for an answer. You can always multiply by 10, 100, 1000, or 10,000 in this way. The rule is, **Move the decimal point as many places to the right as there are zeros in the multiplier.** Add zeros to your answer, if necessary.

Find the products:

	(1)	(2)	(3)
(*A*)	$100 \times .2 = ?$	$1000 \times 7.20 = ?$	$10 \times .6 = ?$
(*B*)	$100 \times 16 = ?$	$100 \times 3.1416 = ?$	$1000 \times 6.25 = ?$
(*C*)	$10 \times .0625 = ?$	$10000 \times .1 = ?$	$100 \times .004 = ?$
(*D*)	$1000 \times .25 = ?$	$1000 \times 5.75 = ?$	$100 \times 75 = ?$

Find the answers:

	(1)	(2)	(3)	(4)
(*A*)	$9\overline{)51.131}$	$3.008 \div 8 = ?$	$7 \times ? = 100.063$	$9\overline{)101.232}$
(*B*)	$4\overline{)29.604}$	$60.201 \div 9 = ?$	$\frac{1}{6}$ of \$41.04 $= ?$	$8 \times ? = 7.032$

Practice Exercises

Find the totals:

1	2	3	4	5
623.0	6.420	96.80	.1461	530.1
440.4	5.706	16.38	.9206	485.8
386.0	9.097	48.89	.7769	570.9
400.7	7.942	56.89	.4605	338.7
267.7	2.306	45.13	.7078	160.1
951.6	9.087	66.44	.2511	348.4
976.1	1.923	21.24	.6460	605.3
8.9	.198	40.30	.0887	112.3

6. Mr. Cushman sold 700 dollars' worth of goods at 7 per cent commission. What was the amount of his commission?

7. On his thirteenth birthday Ralph Cox took 5 of his friends to the motion-picture show. Two of his friends were over 12 and had to have 35-cent tickets. The rest got in for 20 cents each. How much did Ralph spend in all?

8. The enrollment in the Second Ward School is 183. The enrollment in the Third Ward School is 236. Which school is larger? What per cent larger? (Use 183 as your divisor.)

9. Find the total amount of this bill:

14 loaves bread at 15¢ each
15 lb. meat at 40¢ per pound
1 doz. oranges at 87¢ per dozen
4 lb. butter at 65¢ per pound
Vegetables at $1.74
19 lb. sugar at 5¢ per pound

10. What will $27\frac{1}{2}$ tons of coal cost at $9.75 per ton?

11. Jane Mercer's birthday comes $2\frac{5}{6}$ months before Christmas. How many days before Christmas is that?

12. How much is $59 \times \$569.20$?

Dividing with Decimals

You have already learned two kinds of division which have decimals in the answer.

Type I

Example. Divide 252 by 16.

$$
\begin{array}{r}
15.75 \\
16\overline{)252.00} \\
16 \\
\hline
92 \\
80 \\
\hline
120 \\
112 \\
\hline
80 \\
80 \\
\hline
\end{array}
$$

1. Eighty per cent of the people in our village had colds last winter. What per cent of the people did not have colds?

2. A lot is $184\frac{1}{2}$ feet long and $75\frac{1}{3}$ feet wide. What is the area of the lot?

3. Mr. Hill brought 12 dozen eggs to town with him today and sold them at 22 cents a dozen. He bought 20 pounds of sugar at 6.5 cents a pound, 2 dozen oranges at 60 cents a dozen, and 3 cans of tobacco at 15 cents each. Did Mr. Hill get enough for his eggs to pay for all that he bought? Prove your answer.

4. Mr. Bixler bought 100 pounds of pecans for $49.00. He sold them at 80 cents a pound. How much was his margin?

5. What fraction tells the amount of the discount when the rate of discount is 20 per cent?

Do the following exercises in the same way. Do not extend the answer beyond four decimal places.

Divide:

	(1)	(2)	(3)
(*A*)	$75 \div 60 = ?$	$21 \div 12 = ?$	$40 \div 25 = ?$
(*B*)	$175 \div 120 = ?$	$125 \div 75 = ?$	$100 \div 75 = ?$
(*C*)	$8 \div 6 = ?$	$118 \div 92 = ?$	$20 \div 16 = ?$
(*D*)	$77 \div 70 = ?$	$3 \div 2 = ?$	$15 \div 12 = ?$
(*E*)	$216 \div 144 = ?$	$48 \div 36 = ?$	$42 \div 35 = ?$

Type II

You have also learned how to do another kind of division which has decimals in it. In such exercises as change $\frac{2}{5}$ to a decimal you divided the numerator by the denominator. Then you put a decimal point and some zeros after the 2 and divided by the 5. In all such cases you always had a decimal fraction for an answer. You get the same kind of answer when you divide a smaller whole number by a larger one.

Example. What part of 72 is 63?

You have learned to solve this example in this way:

$$\frac{6}{7}\frac{3}{2} = \frac{7}{8}$$

1. Desks for children cost $13.50 each. Mr. Woodward gave a desk to each of his grandchildren. The total of his bill was $81.00. How many grandchildren has Mr. Woodward?

2. What is 6 per cent of $925.00?

3. How many pints are there in 7.1 quarts?

Here is another way to do it, with decimals:

$$
\begin{array}{r}
.875 \\
72\overline{)63.000} \\
\underline{57\ 6} \\
5\ 40 \\
\underline{5\ 04} \\
360 \\
\underline{360}
\end{array}
$$

Therefore .875 is a correct answer as well as $\frac{7}{8}$. Be sure that you point off as many places in your answer as there are zeros added to the dividend.

In solving the following exercises use the method of decimal fractions. Do not extend any of the answers beyond four places.

Find what part the smaller number is of the larger in each example:

(1)	(2)	(3)
(*A*) 478, 7648	1296, 1728	125, 500
(*B*) 5, 2500	1760, 5280	27, 144
(*C*) 1, 50	1700, 2000	240, 320
(*D*) 9, 36	54, 900	5280, 4620

1. John Ames had 240 marbles six weeks ago. He counted his marbles today and found that he had only 150 of them. What part of his marbles are missing?

2. Sixty tons of coal are to be divided equally among 75 poor families. What part of a ton of coal will each family receive?

3. George Adams and his sister have promised to pick 25 quarts of berries. They have already picked 17 quarts. What part of their work is already done?

4. Our baseball team has played 18 games and lost 12 games. None of the games was tied. What part of their games have they won? What part have they lost?

5. Our teacher gave us an examination with 50 questions in it. Arthur Smith answered 35 of them correctly. What part did Arthur have correct?

6. James Todd is hauling water in a barrel. He put 30 gallons in the barrel when he started. When he got to the end of his haul he had only 25 gallons. What part of the water was lost?

7. Mr. Rowland had 24 bushels of apples in his cellar. Some of the apples spoiled. He picked them out and had 20 bushels left. What part of his apples spoiled?

Find the remainders:

	(1)	(2)	(3)	(4)	(5)
(*A*)	.521	76.4	16.28	1.337	1.31
	.066	7.8	7.50	.870	.99
(*B*)	9.564	80.2	112.4	17.52	187.0
	1.665	22.4	43.0	9.90	89.1

1. Change $\frac{9}{16}$ to a decimal.

2. The rent of a small hat shop is $184.00 per month. How many hats at $4.60 must be sold each month to equal the amount due for rent?

Type III

In Type I and Type II the decimals were in the quotient. Sometimes you will need to divide when there are decimals in the dividend. Here are some problems of this sort.

Problem (*A*). If you divide \$48.78 equally among 9 boys, how much will each receive?

$$9\overline{)48.78} = 5.42$$

\$5.42. *Ans.*

Problem (*B*). James Orton had \$15.00. He spent \$11.25. What part of his money did he spend?

$$15\overline{)11.25} = .75$$

$$\begin{array}{r} 10\,5 \\ \hline 75 \\ 75 \end{array}$$

75%. *Ans.*

Notice how these answers are pointed off. There are just as many decimal places in the quotient, or answer, as there are in the dividend. The decimal point in the answer must be just above the one in the dividend. Use zeros when you need them.

1. \$16.50 is how many times \$3?

2. How many buckets of water, each holding 3 gallons, will be required to fill a barrel that holds 31.5 gallons?

3. If a box which holds one cubic foot will hold 7.5 gallons, what will a box hold that is 12 inches long, 9 inches wide, and 8 inches deep?

4. A ton of egg coal occupies about 34.5 cubic feet. How much space will be required to hold 500 pounds of egg coal?

5. If a gallon of water weighs 8.3333 pounds, what will a pint of water weigh?

6. 16.5 feet is how many times 2 feet?

7. An empty milk can weighs 16.4 pounds. A milk can when full weighs 81.7 pounds. How much will a milk can weigh if it is half full?

8. If a bushel contains 2150.4 cubic inches, how many cubic inches does a peck contain?

9. What part of 100 square yards are 30.25 square yards?

10. What part of $15.00 is $6.75?

Add these columns:

1	2	3	4
48.81	.2310	8.273	680.3
74.67	.6449	1.699	405.7
67.88	.8893	6.904	927.1
96.69	.3419	1.847	909.2
71.00	.7295	6.001	271.6
20.14	.3402	2.542	305.7
5.46	.7836	6.297	15.5
3.12	.0265	5.300	94.7

5. A club has 36 members. On very important matters they require that $\frac{2}{3}$ of all who belong to the club must vote for the proposition if it is to carry. How much is $\frac{2}{3}$ of 36?

Type IV

You have learned how to divide when there are decimals in the quotient and when there are decimals in the dividend. Now you are going to learn how to divide when there are decimals in the divisor.

Example (*A*). Ten dollars is how many times $2.50?

$2.50\overline{)10}$ $\qquad$ $250\overline{)1000}$ $\qquad$ 4. *Ans.*

$$\begin{array}{r} 4 \\ 1000 \\ \hline \end{array}$$

Find the quotients:

	(1)	(2)	(3)	(4)
(*A*)	$.7\overline{)588}$	$.09\overline{)359.8}$	$.7\overline{)6014.4}$	$.009\overline{)7.1916}$
(*B*)	$7\overline{)8.2455}$	$.6\overline{)1.836}$	$.07\overline{)24.5}$	$.12\overline{)69.12}$

1. The list price on a table was $60.00. Then it was marked 10 per cent off. What was the net price?

2. If one peck of potatoes weighs 15 pounds, how many pounds will 3.6 pecks weigh?

3. Mr. Dorsey gathered 845 bushels of apples from his orchards. He estimates that 170 bushels were frozen before they could be picked. How many bushels would he have had if none of the apples had frozen? What per cent loss did he have?

4. How many ounces are there in 3.68 pounds?

5. How many yards are there in 32.4 feet?

6. The Mt. Carmel Sunday school has 75 members. Last Sunday 15 members were absent. What was the per cent of attendance?

Example (*B*). Two feet are what part of a rod?

A rod equals 16.5 feet.

$$16.5\overline{)2} \qquad 165\overline{)20.0000} \qquad .1212$$

$$\begin{array}{r} 16\,5 \\ \hline 3\,50 \\ 3\,30 \\ \hline 200 \\ 165 \\ \hline 350 \\ 330 \\ \hline \end{array}$$

.1212 rods. *Ans.*

Example (*C*). Divide 12.5 by .05.

$$.05\overline{)12.5} \qquad 5\overline{)1250} \qquad 250$$

250. *Ans.*

Notice that the example has been rewritten in each case. This is because it is hard to divide when there are decimal places in the divisor. But we can divide easily if we make the divisor a whole number. We can always do this by moving the decimal point to the right. In Examples (*A*) and (*C*) we had to move it two places to the right. In

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1. At an average of 4.2 miles per hour, how far can I walk in 5 hours and 15 minutes?

2. At a remnant sale, Mrs. Boggs bought four pieces of ribbon. One piece measured $2\frac{3}{8}$ yards; the second measured $1\frac{1}{2}$ yards; the third, $1\frac{5}{1\frac{1}{2}}$ yards; and the fourth, 45 inches. How many yards of ribbon did Mrs. Boggs buy in all?

3. A chocolate shop expects to serve 600 cups of chocolate next Saturday. How many gallons will that be?

4. How many quarts are there in 7.91 gallons?

5. How many inches are there in 6.78 feet?

Example (*B*) we moved it only one place to the right. But here is one thing more to remember. If we move the decimal point to the right in the divisor, we must always move it the same number of places to the right in the dividend. Then we can divide just as we did in Type III.

When you solve the following problems, be sure to move the decimal point the same number of places to the right in both divisor and dividend.

1. I bought 2.5 dozen eggs for $1.20. How much was this per dozen?

2. How many yards of cheesecloth at 7.5 cents per yard can I buy for 45 cents?

3. How many rods of fencing at 57.5 cents a rod can be bought for $51.75?

4. Mr. Jones has 50 bushels of apples to put into barrels. How many barrels will he need if a barrel holds 2.75 bushels of apples?

5. A beef roast that weighs 7.5 pounds usually has 1.125 pounds of bone and gristle, which cannot be eaten. What part of the roast cannot be eaten?

6. Mr. Conklin has a bin $10' \times 9' \times 5'$. If one bushel of wheat occupies 1.24 cubic feet, how many bushels of wheat can Mr. Conklin put in his bin?

7. Mr. Graham wishes to build a bin that will contain 228 bushels. If .8 bushel occupies one cubic foot, how large must Mr. Graham make his bin?

8. If gasoline costs \$.0125 per mile, how many miles can I go on \$2.50 worth of gasoline?

9. A cubic foot of water weighs 62.4 pounds. A cubic foot of gold would weigh 1198.08 pounds. Gold is how many times heavier than water?

10. If a cubic foot of coal weighs 89.87 pounds and a cubic foot of water weighs 62.4 pounds, what part of the weight of a cubic foot of coal is a cubic foot of water?

11. If a person needs .1125 pound of sugar per day, how long will 10 pounds of sugar last one person?

12. If coffee is used at the rate of .18 pound per day, how long will 9 pounds of coffee last?

13. If one pound of pickles contains .02 pound of food value, how many pounds of pickles will it take to contain 1 pound of food value?

14. If 2.1 bushels are used in sowing one acre, how many acres will 35 bushels sow?

Find the differences. Watch for catch problems.

(1)	(2)	(3)
(*A*) \$14.53 − \$9.94	9.98 from 189.8	\$960 from \$173
(*B*) 696 from 765	.511 from 9.89	954 − 277

1. How many feet are there in 2.76 yards?

2. $3521 \times 5280 = ?$

3. On Saturday William Bowman worked at different jobs for different prices. He worked 2 hours at 25 cents an hour, $3\frac{1}{2}$ hours at 20 cents an hour, $1\frac{3}{4}$ hours at 35 cents an hour, and $\frac{3}{4}$ hour for 28 cents per hour. What was his average wage per hour on Saturday?

15. A pound of potatoes contains .1 pound of food value. One pound of potatoes has how many times as much food value as a pound of pickles?

You have already learned something about measurements used in France and other foreign countries. In the next problem you will meet with a new measure from France called the **centimeter.** The French people use centimeters instead of inches when they measure.

16. If one inch equals 2.54 centimeters, how many inches are there in 100 centimeters?

17. If one knot equals 1.151 miles, how many knots are there in one mile?

18. One foot equals about .305 meter. How many feet are there in 1000 meters?

19. If a gallon of milk weighs 8.6 pounds, how many gallons does a milk can contain which weighs 16.4 pounds when empty and 81.7 pounds when full?

20. How many square rods are there in a piece of ground 80 yards long and 40 yards wide?

21. How many rods are there in 88 yards?

---

1. How many quarts are there in 78.3 pecks?

2. How many quarts of malted milk will be needed to serve one glassful of malted milk to each of 300 customers? (Count one glassful equal to $\frac{1}{2}$ pint.)

3. Two men estimated a potato crop. One thought there would be 350 bushels and the other thought there would be 688 bushels. The actual yield was 625 bushels. Which man made the better estimate? How much better?

A Short Method of Dividing by 10, 100, 1000, and 10000

Examples

$50 \div 10 = 5$	$50 \div 1000 = .05$
$50 \div 100 = .5$	$50 \div 10000 = .005$

Look at the four numbers above which come just after the equal signs. They are 5, .5, .05, and .005. How do they differ from one another?

Make a rule telling how to move the decimal point when you divide by 10; when you divide by 100; by 1000; by 10,000. Remember that a decimal point is understood after every whole number.

Can you write a rule that will cover all four cases at once?

Get the answers to the following examples by moving the decimal points:

	(1)	(2)	(3)
(*A*)	$500 \div 10000$	$75 \div 10$	$180 \div 10$
(*B*)	$.1 \div 100$	$64000 \div 100$	$27 \div 1000$
(*C*)	$25 \div 1000$	$625 \div 100$	$6 \div 10000$
(*D*)	$.002 \div 10$	$.15 \div 100$	$225 \div 10$

1. If beads are selling at \$.06 per 100, what is the cost of a single bead?

2. Black walnut lumber is selling at \$265 per 1000 foot. How much is that per foot?

3. If bolts are worth 58 cents per 100, what is the value of a single bolt?

4. If cartridges are worth 45 cents per 100, what is a single cartridge worth?

5. When hairpins sell at 5 cents per 100, what is the value of a single hairpin?

6. Roscoe Taylor buys newspapers at 2 dollars per 100. At what price must he sell one paper so as to make one cent on it?

7. Mineral food for poultry is worth $2.85 per 100 pounds. How much is this per pound?

8. New potatoes are sold sometimes at 47 cents for 10 pounds. How much is this per pound?

9. If shingles are selling at $5.50 per 1000, how much is one shingle worth?

Find the quotients:

	(1)	(2)	(3)	(4)
(*A*)	$.6\overline{)640.8}$	$.05\overline{)43.59}$	$7\overline{)76.44}$	$7\overline{)54.339}$
(*B*)	$.8\overline{)841.04}$	$7\overline{)34.016}$	$.3\overline{)2034}$	$.05\overline{)310}$

1. How many dollars are there in 5% commission on 6000 dollars' worth of goods?

2. The Boys' Outing Club has 15 members. They want to buy a toboggan that costs $16.75. They have $5.40 in the treasury. About how much must each member give in order to be able to buy the toboggan?

3. Express $\frac{4}{5}$ as a per cent.

4. Multiply 67.845 by 63.7.

5. How many square feet are there in 957.82 square yards?

Percentage

Decimal numbers of two places are used so much in business that they have received a special name. They are called per cents. You learned something about per cents and percentages in the fifth grade. Now we are going to study them again. You have learned to read .25 as twenty-five hundredths. From now on we shall call .25 twenty-

Find the totals:

1	2	3	4
451.0	$97.86	9.646	$55.41
940.9	13.95	1.567	76.64
276.7	45.05	8.872	62.16
617.1	69.70	9.039	39.72
142.5	22.18	7.179	51.04
566.6	86.72	3.650	17.67
303.9	32.18	3.732	60.43
598.0	2.30	1.003	12.05

5. If $33\frac{1}{3}\%$ of Mrs. Bone's fruit spoiled, what per cent of it was good?

6. Find the area of a floor that is $42\frac{1}{3}$ feet long and $12\frac{1}{2}$ feet wide.

7. Which is cheaper, to buy 10 pounds of coffee for $4.50 or to buy 10 pounds, one pound at a time, for 49 cents a pound? How much cheaper?

8. At the rate of 4.2 miles per hour, how long will it take to walk 16 miles?

9. What is the cost of $\frac{1}{6}$ pint of oysters at 42 cents per pint?

10. How many pints of oysters will it take to serve 126 people if $\frac{1}{6}$ pint is served to each person?

five per cent most of the time. We shall also use the sign % for the word per cent. When there are three or more decimal places in a number, we frequently use the per cent form. Thus .125 equals 12.5%, or $12\frac{1}{2}\%$.

All of anything is often thought of as 1. There are $\frac{100}{100}$ in 1; so 1 may equal 100%. The number that is represented by 100% is called the **base**. If we wish to think of a number larger than the base, we represent it by per cents larger than 100%. Thus 125% means a number which is 25% more than the base. Since per cent means hundredths, 125% = 1.25. We change per cents to decimals by moving the decimal point two places to the left.

Some Things to Do with Per Cents

Change each of these per cents to a decimal:

	(1)	(2)	(3)	(4)	(5)
(*A*)	150%	116%	225%	$103\frac{1}{2}\%$	$187\frac{1}{2}\%$
(*B*)	$113\frac{2}{3}\%$	100%	140%	203%	180%

1. The Winter Sports Association has $1647.45 to spend for ice boats. How many ice boats can they buy with this money if they pay an average of $183.05 for each boat?

2. What is $\frac{2}{3}$ of 30.15?

3. $869.2 \times 7.89 = ?$

4. 2022 is how many times 1675? Get the answer correct to two decimal places.

5. What is 8% of $25000?

6. Mr. Caldwell weighed 132 pounds a year ago. Now he weighs 165 pounds. What per cent has Mr. Caldwell gained in weight?

Change each of these decimals to per cents:

	(1)	(2)	(3)	(4)	(5)
(*A*)	2.75	$1.10\frac{1}{8}$	$1.37\frac{1}{2}$	1.20	$1.66\frac{2}{3}$
(*B*)	1.03	1.00	1.64	2.40	1.25

Fractions of Per Cents

You have often had per cents like $3\frac{1}{2}\%$, $2\frac{1}{4}\%$, $12\frac{1}{2}\%$. Sometimes it is convenient to write all of a per cent in decimal form. That is, instead of writing $3\frac{1}{2}\%$, you may write 3.5%. In the same way you may change $2\frac{1}{4}\%$ to 2.25%.

Write these per cents in decimal form as is done for you in the first example:

	(1)	(2)
(*A*)	$3\frac{1}{2}\% = 3.5\%$	$2\frac{1}{2}\%$
(*B*)	$6\frac{1}{4}\%$	$1\frac{7}{8}\%$
(*C*)	$101\frac{1}{8}\%$	$3\frac{1}{4}\%$
(*D*)	$37\frac{1}{2}\%$	$4\frac{1}{2}\%$
(*E*)	$4\frac{3}{4}\%$	$5\frac{1}{4}\%$

Find the remainders:

1	2	3	4	5
166.8	7.689	.6364	77.13	92.2
79.0	4.990	.3965	73.99	57.7

6. Mrs. Warner bought these things for the baby

1 baby spoon	$1.80
1 hair brush	.63
1 cup	1.12
1 pair moccasins	.65

Find the total of Mrs. Warner's bill.

Example. Find $\frac{1}{2}\%$ of \$10000.

$\frac{1}{2}\%$ means $\frac{1}{2}$ of one per cent. One per cent = .01.

$\frac{1}{2}$ of .01 = .005.

\$10000
.005
\$50.000 \$50. *Ans.*

Work these examples in the same way:

	(1)	(2)
(*A*)	$\frac{1}{8}\%$ of \$30000	$\frac{1}{8}\%$ of \$400000
(*B*)	$\frac{1}{4}\%$ of \$50000	$\frac{1}{4}\%$ of \$20000
(*C*)	$\frac{1}{5}\%$ of \$40000	$\frac{1}{2}\%$ of \$50000
(*D*)	$\frac{1}{2}\%$ of \$1000	$\frac{3}{4}\%$ of \$80000
(*E*)	$\frac{1}{8}\%$ of \$350000	$\frac{5}{8}\%$ of \$25000

The following decimal numbers have been partly turned into per cents.

Fill in the blanks correctly:

(*A*) .05 = 5%. .0625 = 6.25%, or $6\frac{1}{4}\%$. 1.16 = 116%.
(*B*) .875 = 87.5%, or $87\frac{1}{2}\%$. .75 = —— %.
(*C*) .$33\frac{1}{3}$ = —— %. .0025 = —— %, or —— %.
(*D*) .005 = —— %, or —— %. 1.04 = —— %.
(*E*) .15 = —— %. .055 = —— %, or —— %.
(*F*) .0475 = —— %, or —— %.
(*G*) 1.50 = —— %. .96 = —— %. 1.00 = —— %.

The fact that 1.00 may equal 100% is important. This means that 100% is all of anything. If a baseball team has won 55% of its games, it must have lost or tied 45% of the games because all the games are 100%.

See if you can give the right answers to the following problems without using paper and pencil.

1. Mr. James lost 15% of his money. What per cent has he left?

2. John Carter answered 85% of the questions on his examination correctly. What per cent did he miss?

3. Mr. Adams gained 15% on his investment. What per cent did he then have?

4. It has been shown that 95% of all automobile accidents are preventable. What per cent are not preventable?

5. The Ames family spends 25% of the family income for food, 20% for rent, 20% for clothing, 15% for operating expenses, and saves the remainder. What per cent does the family save?

6. If 23.9% of a banana is really nourishing, what per cent is not nourishing?

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1. What is the cost of 3 dozen buttons at $16\frac{2}{3}$ cents per dozen?

2. $\$7.75 - \$7.50 = ?$

3. What is the total weight of 635 boxes if each box weighs $2\frac{1}{2}$ pounds?

4. Robert Burns carries a sail with him when he skates. When the wind is strong he can go 32.5 miles per hour on the average. How far can Robert skate in 2.5 hours at this rate?

5. What part of 30 inches are 3.75 inches?

6. How many feet are there in 31.2 yards?

7. The number of deaths from smallpox has been reduced 99% by vaccination. The number of people who now die of smallpox is what per cent of the number who used to die of that disease?

8. It has been shown that 92.5% of the money spent for food is well spent. What per cent of the money spent for food is wasted?

9. The food of robins is as follows: insects and bugs, 42%; wild fruits, 47%; the remainder, cultivated fruits. What per cent of a robin's food is cultivated fruits?

10. Mr. Smith is a farmer. Last year his corn crop was 75% of the average yield. What per cent less than the average was his crop?

Finding Percentages

Problem. Mr. Harris bought some cattle for $1200 and sold them later at a loss of 15%. How much money did Mr. Harris lose?

15% means .15. That is, Mr. Harris lost .15 of $1200.

$$.15 \text{ of } \$1200 = .15 \times \$1200.$$

$$\begin{array}{r} \$1200 \\ .15 \\ \hline 6000 \\ 1200 \\ \hline \$180.00 \end{array} \quad \textit{Ans.}$$

When we get a per cent of a number, the answer is called the **percentage.** We get the percentage by multiplying the base by the per cent.

See if you can find the percentages in the following examples and problems.

1. 6% of \$300 = \$? .
2. 12% of 2000 pounds = ? pounds.
3. $33\frac{1}{3}\%$ of 6000 cubic feet = ? cubic feet.
4. 20% of 50 dozen eggs = ? dozen eggs.
5. 125% of 20 gallons = ? gallons.
6. 95% of 50 miles = ? miles.
7. 25% of 30 days = ? days.
8. 40% of 10 games = ? games.
9. 100% of 40 pupils = ? pupils.
10. $66\frac{2}{3}\%$ of 5280 feet = ? feet.
11. Our team has won $55\frac{5}{9}\%$ of all the games which it has played. It has played 18 games in all. How many games has it won?
12. There were fifty questions in Mary Ford's examination. She received a grade of 86%. How many questions did Mary answer correctly?

Find the answers:

(1)	(2)	(3)
(*A*) $\frac{1}{5}$ of 2.125	$.6 \times ? = 365.317$	$.09\overline{)23202}$
(*B*) $\frac{1}{9}$ of 53211	$.09 \times ? = 60.1128$	$.002\overline{).1296}$

1. What per cent of 84 is 42?
2. Express $\frac{2}{3}$ in per cent.

13. The state is building 20 miles of road in our neighborhood. If 75% of the job is completed, how many miles are now built?

14. Mr. Arnold buys eggs and ships them. Last week he shipped 75 dozen eggs, but 20% of them were frozen on the way. How many dozen were frozen?

15. Grace Johnson has an annual income of $1200. She plans to use her money as follows: for food, 30%; for room rent, 20%; for clothing, 20%; for incidentals, 15%; for savings and entertainment, 15%. How much money will she have to spend for each of these if she is going to carry out her plan?

16. Flour is 12% water. How many pounds of water are there in a barrel of flour which weighs 196 pounds?

17. The area of the window glass should be about 18% of the area of the floor in a schoolroom. At this rate, how much glass will it take for the windows of a schoolroom if the floor is $20' \times 30'$?

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1. Jane and Frances Hill estimated the weight of a fruit cake that their mother had made. Jane's estimate was $8\frac{1}{4}$ pounds. Frances thought that the cake would weigh only $6\frac{7}{8}$ pounds. The cake actually weighed $7\frac{1}{2}$ pounds. Which girl made the better estimate? How much better?

2. If a pint of cranberries weighs .75 pound, how much will 32 quarts of cranberries weigh?

3. Miss Shippey, who teaches English, is paid $1900 for $9\frac{1}{2}$ months' work. What is Miss Shippey's salary per month?

4. Change $\frac{3}{50}$ to a decimal.

18. The amount of butter fat in milk is about 3.5%. How much butter fat will there be in 180 pounds of milk at this rate?

19. Hogs lose about 30% when dressed. At this rate, what will the meat from a 250-pound hog weigh?

Finding Per Cents

Sometimes we need to know what per cent one number is of another. "What per cent" means just the same as "what part of," but the answer is always stated in terms of per cent.

Problem. John Mason had 60 marbles. He lost 15 of them. What per cent of his marbles did John lose?

If the question were What part of his marbles did John lose? we should think of a fraction made up by putting the 15 over the 60. Then we should put a decimal point and some zeros after the 15 and divide by the 60. This is exactly what we do in finding per cents, but to get a per cent we always add just two zeros, thus:

$$
\begin{array}{r}
.25 \\
60\overline{)15.00} \\
\underline{12\,0} \\
3\,00 \\
\underline{3\,00}
\end{array}
\qquad 25\%. \ \textit{Ans.}
$$

Solve these problems in a similar manner:

1. Mr. Adams had 30 bushels of apples in his cellar. When he went to get them out he found that 5 bushels had rotted. What per cent had rotted?

2. Our baseball team has won 12 games out of 20. What per cent of games has it won?

3. Mr. Robbins has a farm containing 80 acres. Five acres are subject to overflow from the river. What per cent of his farm is subject to overflow?

4. Martha Turner answered 45 questions out of 50 correctly in her examination. What was Martha's grade expressed as a per cent?

5. Ellen Holmes spent last Tuesday as follows: at school, 6 hrs.; at the table, 1.5 hr.; minding the baby, 1.5 hr.; helping her mother in the kitchen, 2 hr.; playing, 3 hr.; sleeping, 10 hr. What per cent of the whole day did Ellen spend at each thing?

6. The following table gives a record of deaths from accidents in the United States in 1920:

Type of Accident	Number of Deaths per Day
Falls	34
Automobiles	30
Burns	22
On the railroad	21
Drowning	17
Escaping gas	10
Firearms	8
All other causes	66

Find the total number of accidents. Find the per cent of accidents due to each cause.

7. A road rises 211.2 feet in a mile. What is the per cent of its grade?

8. The following table gives a record of the causes of automobile accidents in 1920:

Cause of Accident	Number of Accidents
Poor roads	153
Striking curbing	282
Running into ditch or bank	178
Striking a building	555
Striking another vehicle	4580
Striking other objects	1875
Upset without collision	26
All other causes	16

Find the per cent of accidents due to each cause.

9. In 1894 the military expenses of the United States were as follows:

For the army . . . . . 55 million dollars
For the navy . . . . . 32 million dollars
For pensions . . . . . 141 million dollars

What per cent is each expenditure of the total amount spent for military purposes?

10. When a thing becomes less it is said to **decrease.** The amount by which it becomes less is often spoken of as the **amount of decrease.** The following figures show the average number of eggs laid by three kinds of hens during their first and second years:

Kind of Hen	First Year	Second Year
Plymouth Rocks	148	121
Rhode Island Reds	145	108
Leghorns	172	132

What is the amount of decrease for each kind of hen?

11. Decreases are often figured in per cents. The per cents are figured on the first, or larger, value as base. Thus in finding the per cent of decrease for Plymouth Rocks you find what per cent 27 (the amount of decrease) is of 148. What is the per cent of decrease for each kind of hen mentioned in problem 10? What kind of hen shows the greatest per cent of decrease?

12. The American Relief Fund after the World War was spent as follows:

For Poland	57 million dollars
For Armenia	10 million dollars
For Czechoslovakia	7 million dollars
For Russia	4 million dollars
For Finland	3 million dollars
For Latvia	2.5 million dollars
For Lithuania	1 million dollars

What per cent of this relief fund did each of these countries receive?

Find the differences:

	(1)	(2)	(3)
(*A*)	1.44 − .87	7.46 − 1.80	104.82 − 10.04
(*B*)	89.2 − 68.3	.193 − .130	87.9 − 33.3

1. How many minutes are there in 8.76 hours?

2. How many quarts are there in 160 pints?

3. A gas stove was marked $125, regular price. It was sold for $90.00. What was the per cent of discount?

4. How many square feet are there in 58.94 square yards?

5. How many days are there in 6.7 weeks?

Baseball Problems

1. Our baseball team has played 17 games and won 8 of them. What per cent has it won?

In figuring baseball standings three zeros are added instead of two, and the three figures in the answer are read or understood as thousandths. The standings are usually spoken of as per cents.

2. On August 7 the number of games won and lost by the National League teams was as follows:

Team	Games Won	Games Lost
Pittsburgh .	59	39
New York .	58	43
Cincinnati .	54	46
Brooklyn . .	48	48

Team	Games Won	Games Lost
St. Louis . .	49	54
Philadelphia	46	51
Chicago . .	44	57
Boston . .	42	62

Find how many games each team has played and what per cent of the games each team has won. Tie games are not counted.

---

1. $349 \times \$75.92 = ?$

2. $\$33.80 \div 65$ cents $= ?$

3. Kate Norton wishes to buy a coat that is marked \$152.75. She has only \$89.07. How much more money does Kate need?

4. How many ounces are there in 5.2 pounds?

5. A furniture merchant bought a chair for \$4.65. He sold it at 135% of the cost price. How much did he get for the chair?

3. Suppose Pittsburgh plays a 3-game series with New York, beginning August 8, and wins all 3 games. How will the report read for these two cities then? What will be the per cent won by each team if Pittsburgh wins all 3 games?

4. What will be the per cent for each team if New York wins all 3 games?

5. Find the per cent for each team if Pittsburgh wins 1 game, New York wins 1 game, and they tie the third game.

6. Find the per cent for each team if New York wins 2 games and Pittsburgh 1 game.

7. Find the per cent for each team if Pittsburgh wins 2 games and New York wins 1 game.

8. There are 50 more games to play before the end of the season. If Boston wins 30 games and loses 20, what will Boston's per cent be at the end of the season?

Find the sums:

1	2	3	4	5
8.989	$89.96	.3213	898.4	.9374
3.809	37.98	.5047	438.9	.2839
4.310	79.47	.2898	780.1	.8939
8.541	51.60	.4603	715.6	.5313
2.774	9.11	.5746	180.6	.7389
4.030	.34	.4080	427.3	.2431

6. One week ago Ralph Grimes had $113.83 in the bank. He made no deposits during the week and now he has $56.45 in the bank. What per cent of his money has he drawn out during the week?

9. Suppose Boston should win all fifty of the remaining games. Would Boston's per cent at the end of the baseball season be as high as Pittsburgh's per cent was on August 7? Prove your answer.

10. If Pittsburgh lost all the games that were played after August 7, would its per cent be as low at the end of the season as Boston's per cent was on August 7?

Special Per Cents

In some cases it is easier and quicker to change per cents to common fractions. Here are some per cents that you should know as common fractions. Copy them in your notebook and learn them if you do not know them.

$16\frac{2}{3}\% = \frac{1}{6}$	$12\frac{1}{2}\% = \frac{1}{8}$	$62\frac{1}{2}\% = \frac{5}{8}$
$11\frac{1}{9}\% = \frac{1}{9}$	$8\frac{1}{3}\% = \frac{1}{12}$	$50\% = \frac{1}{2}$
$14\frac{2}{7}\% = \frac{1}{7}$	$25\% = \frac{1}{4}$	$87\frac{1}{2}\% = \frac{7}{8}$
$66\frac{2}{3}\% = \frac{2}{3}$	$37\frac{1}{2}\% = \frac{3}{8}$	$33\frac{1}{3}\% = \frac{1}{3}$
$10\% = \frac{1}{10}$	$20\% = \frac{1}{5}$	$75\% = \frac{3}{4}$

Find the percentages by changing the following per cents into common fractions:

(1)	(2)
(*A*) $16\frac{2}{3}\%$ of 90 lb.	$37\frac{1}{2}\%$ of \$160.00
(*B*) 25% of 200 gal.	$66\frac{2}{3}\%$ of 24 hr.
(*C*) $14\frac{2}{7}\%$ of 35 bu.	$8\frac{1}{3}\%$ of \$250.00
(*D*) $11\frac{1}{9}\%$ of 90 A.	5% of 2000 lb.
(*E*) $12\frac{1}{2}\%$ of \$20.00	$62\frac{1}{2}\%$ of 5280 ft.

Margin. When a merchant has bought his goods and has put them into his store, he has to decide what prices he will charge for them. He cannot afford to sell the goods at just what they cost him. He must receive enough more than the cost to pay for the expenses of running his business and to give him a reasonable amount for his own labor and risk. The expenses of running a business are often called **operating expenses.** The amount which a merchant receives for his labor and risk is called the merchant's **profit.** The sum of the operating expenses and the profit is sometimes spoken of as **margin** or **mark-up.**

The selling price is the sum of the cost, the operating expenses, and the profit.

The margin, or mark-up, is the sum of the operating expenses and the profit.

The selling price is the cost plus the margin.

1. How far does a train go in 7.9 hours at an average rate of 37.2 miles per hour?

2. Mildred Marshall weighs $87\frac{3}{4}$ pounds. For her age and height she should weigh 93 pounds. How many pounds under weight is she?

3. How many pints are there in 7.8 quarts?

4. A city of 30,000 population gained 1500 in one year. What per cent of gain is that?

5. How many pounds of candy at 65 cents a pound can you buy for $31.20?

6. How many quarts are there in 78.4 gallons?

Finding the Base

First Method

Sometimes we have the per cent and percentage given and want to find the base. A case of this sort occurs when a merchant wishes to mark the selling price on goods that he has just received. Merchants usually know what per cent of margin they must have. Suppose a merchant receives a bill of goods amounting to \$500.00 and that he must have a 40% margin in order to carry on his business. Business men sometimes think of what they receive for their goods as the base. That is, the selling price is considered the base. When we subtract the 40% margin, we have $100\% - 40\% = 60\%$. The cost is therefore 60%. In the case above, the \$500.00 will be 60% of the amount which the merchant expects to receive for the goods. If \$500.00 is 60% of the selling price, 1% of the selling price

Find the answers:

(1)	(2)	(3)
(*A*) $\frac{1}{8}$ of 201.416 = ?	$.9\overline{)7341.43}$	$.02 \times ? = 28.78$
(*B*) $\frac{1}{7}$ of 1102.5 = ?	$.007\overline{)102.4}$	$1.7 \times ? = 23.8$
(*C*) $\frac{2}{9}$ of 301.06 = ?	$.8\overline{)3.}$	$.05 \times ? = 150$

1. A village has a population of 624 persons. Forty-six of the people in the village are under quarantine. What per cent is that?

2. How much is saved by buying 2 dozen spools of thread at 50 cents a dozen instead of buying them at 5 cents each?

will be $\frac{1}{60}$ of \$500.00, or \$8.33$\frac{1}{3}$. Then 100%, or the whole selling price, will be $100 \times \$8.33\frac{1}{3}$, or \$833.33. This is the selling price for the goods.

A Shorter Method

We may get the same result more quickly if we divide the \$500.00 by 60%. $60\% = .60$. $\$500.00 \div .60 = \$833.33$, as before. We can always find the base by dividing the percentage by the rate, or per cent.

1. \$60 equals 6% of how many dollars?

2. Mr. Mason's cows give milk that is $3\frac{3}{4}$ per cent butter fat. Mr. Mason sold $18\frac{3}{4}$ pounds of butter today. How many pounds of milk were used in obtaining this amount of butter?

3. Mr. Catron raises apples and sells them. Usually 25% of his apples are faulty and have to be thrown out. Mr. Catron has promised to furnish 90 bushels of apples to the store in town. How many bushels must Mr. Catron pick in order to get 90 bushels of good apples?

---

1. It costs \$35.00 to put out an issue of our school paper. The advertising brings in \$15.75 for each issue. How many copies of the paper must we sell at 5 cents each in order to come out even?

2. How many inches are there in 9 feet?

3. $1156 \div 48 = ?$

4. If a gallon of milk weighs 105.6 ounces, what will a pint of the same milk weigh?

5. How many feet are there in 31.2 yards?

4. The cost of a pair of shoes was \$4.00. The margin is 25%. What must the selling price be?

5. Mr. Bates is a very old man. He wishes to invest enough money to provide \$1200 a year income for his granddaughter. He finds a safe investment which pays 5% interest. How many dollars must Mr. Bates invest to insure an income of \$1200 per year to his granddaughter?

6. Mr. and Mrs. Mercer wish to give the Y.W.C.A. enough money to endow, that is, to provide for the yearly expense of maintaining, a physical director for the girls. How much must be invested at 6% if the expense will be \$2250 per year?

7. A millinery store buys hats at \$2.10 each. The margin is 35%. What should be the average selling price per hat?

8. How much money does it take to yield \$90.00 interest each year when the rate is $4\frac{1}{2}\%$?

9. Twenty-one is $3\frac{1}{2}\%$ of what number?

Find the differences:

1	2	3	4	5
\$18.77	\$91.91	\$63.31	\$153.78	\$37.92
9.99	34.94	36.32	98.01	10.09

6. How much is $162.5 \div .25$?

7. Jane Masters bought a sweater. The list price of the sweater was \$12.00, but there was a discount of $16\frac{2}{3}\%$. She paid for the sweater with a check for \$12.41. How much change should Jane receive?

Trade Discount

Sometimes business men wish to sell off their goods at reduced prices in order to get rid of them before they spoil or get out of style. They often advertise their goods at 10% discount, or 10% off. Large wholesale merchants often publish catalogues of prices and announce that these prices are subject to a discount for cash. Sometimes they announce a price with 20, 10, and 5 off. This means three discounts, 20%, 10%, and 5%, taken in that order. The original price is called the **list price.** The price after the discount or discounts are subtracted is called the **net price.** The amount which is taken off is called the **discount.** The net price is the one you have to pay.

Problem (*A*). An overcoat that was selling at $75 is put on sale at 20% off. Find the amount of the discount and the net price.

$75.00	$75.00
.20	15.00
$15.0000	$60.00

The amount of the discount is $15, and the net price is $60.00.

1. How many gallons are there in 80 quarts?
2. How many feet are there in .254 mile?
3. A $3\frac{1}{4}$-yard remnant of China silk sold for $2.75. How much was saved by buying this remnant instead of buying the same amount of silk at 98 cents a yard, regular price?
4. How many yards are there in 39 feet?
5. How many quarts are there in 6.73 pecks?

Problem (*B*). A radio set is listed at $40 with 20, 10, and 5 off. Find the net price and the total amount of the discount.

Step 1	Step 2	Step 3	Step 4	Step 5
$40.00	$40.00	$32.00	$32.00	$28.80
.20	8.00	.10	3.20	.05
$8.0000	$32.00	$3.2000	$28.80	$1.4400

Step 6	Step 7
$28.80	$40.00
1.44	27.36
$27.36, net price	$12.64, total discount

Find the differences:

1	2	3	4	5
64.33	8.856	.9172	.913	767.4
17.44	2.968	.2994	.669	107.5

6. Find the total amount of this bill:

1 basket ball	$2.15
1 pair of blankets	3.49
5 bath towels at 22 cents each	1.10
1 pair pruning shears	1.68
1 lb. blue grass	.45

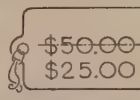
7. What is the area of a baseball diamond that is 90 feet square?

8. What is $2\frac{1}{2}\%$ of $2000?

9. The gross weight of a load of coal was 6240 pounds. The tare was 2240 pounds. What was the net weight?

10. Mr. Bates paid $3000 for a tract of land containing 12.6 acres. What was the cost per acre?

Study Problems (*A*) and (*B*). Solve the following problems in a similar way. Use common fractions in finding percentages when it is easier to do so.

1. John Rogers works in a clothing store on Saturdays. Last Saturday his work was to make new price tags for a sale which the store is planning to put on. At the sale everything in the store is to be sold at 50% off. The tags which John made look like this 

. This means that an article which has been selling at $50.00 will be sold at a net price of $25.00. Tell what John wrote on the tags for each of the following articles:

a. Men's belts; original price, 60 cents each
b. Boys' blouses; original price, 80 cents each
c. Men's rubber boots; original price, $5.50 a pair
d. Men's overcoats; original price, $70.00 each
e. Men's hats; original price, $6.00 each
f. Boys' overalls; original price, $1.70 a pair
g. Men's work gloves; original price, $1.50 a pair
h. Boys' raincoats; original price, $9.00 each
i. Men's shoes; original price, $11.00 a pair
j. Men's shirts; original price, $3.50 each
k. Boys' suits; original price, $13.00 each

2. Mr. Carter buys dress goods at $2.00 per yard and sells them for $2.80 per yard, regular price. Can Mr. Carter put on a sale of these dress goods at 20% off and still receive more than the goods cost him? Prove your answer.

---

1. What is the cost of $16\frac{1}{3}$ dozen oranges at 75 cents a dozen?

2. Thirty-six pounds are 18% of what number of pounds?

3. The Great Northern Mercantile Company allows 10% off for cash. Mrs. Brock bought the following bill of goods from the company. How much will she save if she pays cash?

Two velvet rugs at $25.00 each
A coat for $85.00
Dress material as follows:
For size 36 — $4\frac{1}{8}$ yd., 36-in. French voile at $2.25 per yard
Trimming — $\frac{1}{2}$ yd., at $2.48 per yard
$3\frac{1}{2}$ dozen buttons at 10 cents a dozen
Findings, 15 cents
Pattern, 45 cents

4. Our city market has a fruit sale on Saturday nights. Last Saturday Mrs. Jones bought 25 quarts of berries. The regular price of the berries was 35 cents a quart, but Mrs. Jones got them at 25% discount. Five quarts of the berries spoiled, however, before Mrs. Jones could use them. Did she gain or lose? How much?

Find the sums:

1	2	3	4
410.2	$12.60	3.610	888.2
909.9	66.72	6.544	428.6
145.0	71.08	7.074	827.8
693.4	15.89	2.797	243.5
305.6	98.73	6.585	960.0
652.7	90.03	5.508	86.8
466.2	9.26	3.317	11.5
184.9	4.58	3.080	50.3

5. The Salem ball team has lost or tied 39.3% of its games. What per cent of its games has it won?

5. The furniture store on our street is advertising as follows:

	Regular Price	Net Price
A dining-room set	$298.00	$179.00
A davenport	$165.00	$138.00
A bedroom set.	$348.00	$258.00

How much is the total amount of the discount on these articles? What is the per cent of discount in each of the three cases?

6. Mrs. Adams wishes to buy some silver for her table. She can buy it at the local store for $130.00. She can buy the same silver at another store for $168 with a discount of 30, 10, and 5. At which place does the silver cost less? How much will Mrs. Adams save if she buys at the cheaper price?

1. How many acres are $\frac{5}{12}$ of 86.4 acres?

2. How many square feet are there in a rectangle that is 8.5 ft. long and 4.6 ft. wide?

3. A photographer charges 59 cents for printing and developing 8 snapshots. The developing costs 15 cents for all the pictures. What is the cost of printing each picture?

4. How much is 129.84×37.9?

5. Mr. Coates and Mr. Cowan estimated the price that Mrs. Baxter's lot would bring. Mr. Coates estimated the price at $3150. Mr. Cowan thought the lot would bring only $2250. The actual selling price was $2825. Which man made the better estimate? How much better?

7. In each of the following cases which plan is cheaper? How much cheaper?

a. To buy a canoe at $60.00 or to buy one equally good for $100.00 with 30, 10, and 5 off?

b. To buy a set of drums and bells for $50.00 at 30, 10, and 5 off or to buy an equally good set for $50.00 at 45% off?

c. To buy a watch for $25.00 or to buy an equally good one for $45.00 at 30, 10, and 5 off?

8. Last December Grace Blaine wanted to buy a dress that cost $45.00. She had enough money, but her mother told her to wait until after Christmas to buy the dress because she could then get it at a discount of 25%. Grace's mother said that she could save at least $10.00 and have that much more to spend for Christmas if she waited. Grace spent the ten dollars and waited until after Christmas. The sale took place with 25% discount. Did Grace have enough money to buy the dress? Prove your answer.

Find the quotients:

	(1)	(2)	(3)	(4)
(*A*)	$.07\overline{)10.22}$	$.8\overline{)20176}$	$.009\overline{)3.0213}$	$6\overline{)31.134}$
(*B*)	$.05\overline{)315}$	$.003\overline{)10.11}$	$.3\overline{)2.057}$	$4\overline{).1104}$

1. Mary Carson made 6 doll dresses for the Easter sale. The dresses cost her $3.26 all together. They were sold at $2.00 each. How much money did Mary make on her dresses?

Making and Losing Money

When we spend money for something we often say that we make an **investment.** People who make investments usually expect to gain money; that is, they expect to sell what they have bought for more money than they paid for it. As you have already learned, the difference between the cost and the selling price in such cases is called the margin. But sometimes people who have made investments have to sell for less than they paid for the investments. In such cases the selling price is less than the cost and the difference between the two is called the **loss.**

Some kinds of investments suffer because the thing bought tends to become less valuable. For example, houses and barns grow old. The paint washes off and the shingles rot. Another example is an automobile, or some other kind of machine, which becomes less valuable because it soon begins to wear out. Decrease in value of this sort is called wear and tear, or **depreciation.** Investors who are wise try to reduce wear and tear, or depreciation, by frequently spending money for repairs. Such expense is called **upkeep.**

---

1. 182.16 is how many times 24?

2. A lot of goods sold at $500, with 20, 10, and 5 off. What was the net price?

3. Bill Reynolds was coasting down the high-school hill. The first time he coasted 10.5 blocks; the second time, $8\frac{3}{4}$ blocks; the third time, 9.75 blocks; and the fourth time, 11 blocks. What was his average distance?

4. Multiply 567.3 by 5.97.

On the other hand, some investments tend naturally to increase in value as time passes. Houses and land in or near a growing city are examples of this sort. Such increase in value is called the **unearned increment.**

The value of some investments depends also on the expenditure of money to keep them going. Thus a man who invests his money in a house must also spend money for fuel, light, and water. Otherwise his investment would be of no use to him. In like manner people who own cows must buy food, water, and shelter for the cows. Those who own automobiles must spend money for gasoline and oil. Expenditures such as these, which are necessary to keep investments going, are called **operating expenses.**

There is another sort of operating expense in which all should share. No investment is safe unless it is protected. There must be some way to keep thieves from stealing it. The money which has been spent for almost every kind of investment would be lost if the government of the United States should fail. Farms, homes, and stores could be stolen from their owners at any time. Someone else could

Find the differences:

1	2	3	4	5
\$13.56	.837	\$11.34	7.864	\$91.32
7.98	.699	2.00	3.955	44.53

6. A tractor can run 9.5 miles per hour. How long will it take to go 30 miles at this rate?

7. If one roasted chicken serves 8 persons, how many chickens will be required to serve 96 persons?

take away from you everything that you own if Uncle Sam were not on the job. Expenditures for the support of the government are called **taxes.**

Investments must also be protected from fire, flood, and storm. Money spent for this purpose is called **insurance.**

No investor can keep all his margin. He must spend part of it for upkeep, operating expenses, taxes, and insurance. The amount which he has left after paying all expenses is called his profit. The margin is the sum of the operating expenses and the profit if there is any.

Practice Exercises

Find the answers:

	(1)	(2)	(3)	(4)
(*A*)	$.02\overline{)6.96}$	$\frac{1}{4}$ of 49.2 = ?	$.4\overline{)7.36}$	.005 × ? = .225
(*B*)	$.3\overline{)307.2}$	$\frac{2}{7}$ of 200.9 = ?	$.08\overline{)3}$	.625 × ? = 401.22

1. One package of cereal weighs 22 ounces. How many pounds will 36 such packages weigh?

2. Jim, Jack, Don, and Nubs were playing catch. They should not have played too near any house. As a result they broke Mrs. Webster's window. It cost $4.50 to replace the window, but Mrs. Webster offered to pay half of it. How much must each boy pay if the boys share their part of the cost equally?

3. At 4.5 miles per hour how far could a person walk in 2.4 hours?

4. A tunnel in the mountains is $1\frac{3}{4}$ miles long. How many feet are there in $1\frac{3}{4}$ miles?

5. Mr. Storm received this statement of his account with the Alaska Coal Company. The column headed debit shows the value of the coal which Mr. Storm bought. The column headed credit shows how much Mr. Storm has paid.

Sold to Mr. J. A. STORM
425 East 9th Street

DATE	DEBIT	CREDIT	BALANCE
November 1	$56.61		
November 15		$25.00	
December 2	63.25		
December 20		50.00	
January 1	71.69		
January 15		60.00	
January 28	91.85		
February 10		85.00	
March 1	51.51		
March 15		40.00	
April 15	9.49		
May 3	5.06		

Find the balance which Mr. Storm owes to the Alaska Coal Company.

6. Julia Conway sells to the grocer 16 quarts of strawberries at 23 cents a quart. She buys these goods:

2 lb. coffee at 45 cents per pound
9 lb. apples at $8\frac{1}{3}$ cents per pound
$\frac{3}{4}$ lb. cheese at 40 cents per pound

How much money should the grocer pay to Julia?

7. Express $\frac{5}{6}$ as a per cent.

8. How many feet are there in $45\frac{2}{3}$ yards?

9. 85 cents − 56 cents = ?

10. Change $\frac{4}{25}$ to a decimal.

Problems on Investments

1. Robert Quarles bought a dog for $25.00 and sold him 30 days later for $30.00. It cost Robert 20 cents a day to feed the dog while he owned him. Did Robert profit or lose by the transaction? What per cent is this of the cost of the dog?

2. Mrs. Logan runs a millinery store. Last spring she bought 200 ladies' hats for $3.50 each and expected to sell them at $5.00 each, regular price. She sold 75 of them at this price. Then the hats began to go out of style and she offered them at 25% off from the regular price. She sold all but 10 of

---

Find the totals:

1	2	3	4	5
2.300	.5411	541.0	64.30	2.631
7.885	.7289	889.9	77.98	7.706
6.624	.1907	220.9	54.00	4.687
6.069	.7182	785.0	36.74	2.292
3.301	.4879	748.9	50.09	8.709
1.514	.2306	127.4	39.14	6.380
4.466	.5072	370.6	52.52	1.031
5.089	.4710	116.1	11.98	1.144

6. Four boys walked around Lake Monona in $8\frac{3}{4}$ hours of walking time. The distance around the lake is 30 miles. What was their average rate per hour?

them. What per cent of margin did Mrs. Logan make? If her expenses for operating, advertising, and insurance were 20% of the original cost, did she profit or lose? How much? What per cent?

3. The amount of depreciation on one kind of automobile is 30% for the first year, 40% for the first two years, and 50% for the first three years. According to these figures, what is the present value and the total amount of depreciation on each of the following cars?

a. A sedan bought 2 years ago for $800.

b. A coupé bought 3 years ago for $650.

c. A touring car bought last year for $450.

4. On another type of car the depreciation is 50% for the first year, 70% for the first two years, and 85% for the first three years. Which man will get more for his car if he sells it, the man who bought one of these cars for $1800 three years ago or the man who owns the coupé mentioned in problem 3? How much more will he get?

---

1. Our Boy Scout Patrol has a membership of 14. The average attendance for the year was 11.73. What was the average per cent of attendance?

2. Jim Baskett wants a lasso 32 feet long. He has a rope $14\frac{7}{12}$ feet long. How much more rope does Jim need? Allow $\frac{1}{2}$ foot for splice.

3. Our dairy bill was $8.90 last month. We get a discount of 10% if the bill is paid before February 10. We paid the bill on February 6 with a check for $12.58. How much change did we receive?

4. Forty miles is 25% of what number of miles?

5. Mr. Smith bought 100 boxes of berries for his store at 20 cents a box. He sold 70 boxes at 35 cents a box, but the remainder of the berries spoiled before he could sell them. His operating expense was 30% of the cost. Did Mr. Smith profit or lose? What per cent?

6. John Coleman works in his father's store outside of school hours. He has been putting price tags on the goods as they are unpacked. Mr. Coleman figures that his operating expenses are 30%, everything included. He would like to make a profit of 8%. John figures what the selling price must be on each article in order to make the amount of profit that his father wants. Below are the costs of some of the articles. Find what John puts on the tag as selling price in each case.

Articles	Cost
Woolen goods	$1.60 per yard
Bedspreads	$2.50 each
Oilcloth	$.30 per yard
Mesh bags	$2.25 each
Flannel	$.90 per yard
Linoleum	$1.75 per yard
Ribbon	$.25 per yard
Shirts	$1.25 each
Linen towels	$.40 each
Cheesecloth	$.05 per yard

Subtract the following:

1. 67 cents from 98 cents.
2. 67 cents from 1 dollar.
3. $2.75 from 5 dollars.
4. 25 cents from $1.25.
5. $1.25 from 2 dollars.
6. 89 cents from 1 dollar.

7. Grace Logan bought a bicycle for $30.00 just before school began. She sold it just after school closed for $20.00. While school was in session she rode to school and back on it 180 times. Her expenses for operation and upkeep were $2.00. If she had not bought the bicycle she would have had to pay 5 cents each way on the street car for each of the 180 trips. Did Grace profit or lose on her investment? What per cent?

8. Mr. Jones bought a farm in 1880 for $50 an acre. At Mr. Jones's death forty years later, the land was worth $150 an acre. What was the per cent of unearned increment?

9. The unearned increment on a city lot has been 150% in the past thirty years. What is the present value of the lot if it cost $2500 thirty years ago?

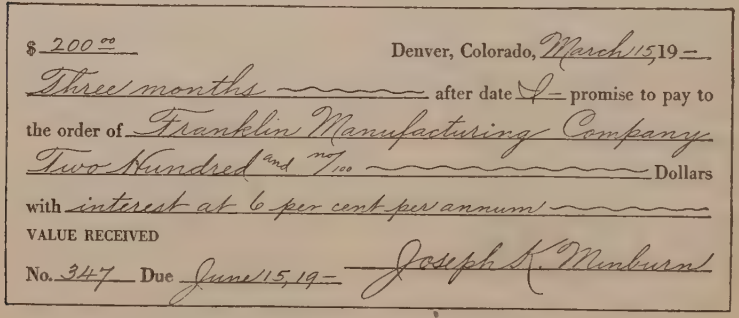
10. A piece of property cost $5000 ten years ago. The taxes and upkeep during that time have been $2750, but the unearned increment has been 70% during that time. Has the owner profited or lost by holding the property? How much?

---

1. What part of 22.5 is 3.75?
2. How many quarts are there in 6.3 gallons?
3. The regular price of a piano was $185.50, but it was sold at $139.10. What was the per cent of discount?
4. What per cent is $37.50 of $200?
5. Change $6\frac{3}{4}$ feet to inches.
6. 8017.038 is how many times 9?
7. How many minutes are there in 9.72 hours?

Borrowing and Lending Money

At times almost everyone needs to use more money than he has. At such times a person who is known to be honest can usually borrow money from some other person or from a bank. When a person borrows money he gives his written promise to pay the money back together with a certain per cent of interest. Interest is



$ 200.00 Denver, Colorado, March 15, 19—

Three months after date I promise to pay to the order of Franklin Manufacturing Company Two Hundred and no/100 Dollars with interest at 6 per cent per annum

VALUE RECEIVED

No. 347 Due June 15, 19— Joseph K. Mulburn

A Promissory Note, with Interest

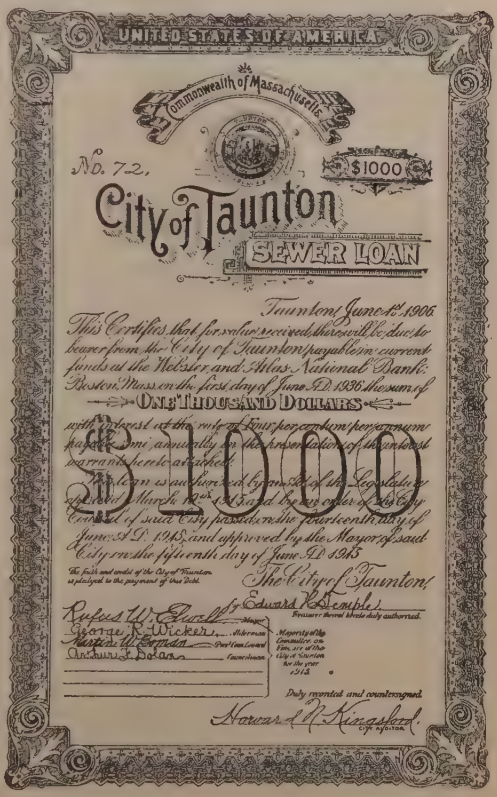
money paid for the use of money. It is reckoned as a per cent of the sum of money borrowed, which is called the **principal.** The written promise to pay is called a **promis-**

Find the quotients:

	(1)	(2)	(3)	(4)
(*A*)	$60\overline{)51.4}$	$.06\overline{)6.012}$	$.72\overline{)41.3}$	$.9\overline{)40.5}$
(*B*)	$.95\overline{)621}$	$65\overline{)12025.75}$	$.8\overline{)48}$	$84\overline{)48}$

1. How many quarts are there in $76\frac{1}{4}$ pecks?
2. How many minutes are there in .72 hour?
3. $98.76 \times 41.5 = ?$

sory note. The per cent of interest paid is called the **rate**. The rate varies with the length of time that the money is kept and the sort of security given. Security means the pledge, or guarantee, that the borrower can pay the money that he owes when it is due. For loans that are to last for a long period of years the rate is usually from 4% to 7%, and the security which is given is often a bond or mortgage. Whenever a school district, city, village, state, or the United States government borrows money, the security assumes the form of a bond. A **bond** is a written promise to pay the amount of money borrowed and the interest at a stated time. Business houses and corporations also issue bonds when they need money. The picture on this page shows how the face of a bond looks.


UNITED STATES OF AMERICA
Commonwealth of Massachusetts
No. 7-2.
$1000
City of Taunton
SEWER LOAN
Taunton, June 1st 1906
This Certifies that for value received there will be due to
bearer from the City of Taunton payable in current
funds at the Webster and Atlas National Banks
Boston, Mass. on the first day of June A.D. 1936 the sum of
ONE THOUSAND DOLLARS
with interest at the rate of four per cent per annum
payable semi annually on the presentation of the interest
warrants hereto attached.
This loan is authorized by vote of the Legislature
of Mass. March 1st 1906 and by an order of the City
Council of said City passed on the fourteenth day of
June A.D. 1905 and approved by the Mayor of said
City on the fifteenth day of June A.D. 1905
The faith and credit of the City of Taunton
is pledged to the payment of this Debt.
The City of Taunton,
By Edward L. Temple
Treasurer thereof duly authorized.
Rufus W. Peck
George R. Wicker
Martin H. Cornell
Anthony L. Dolan
Aldermen
Committee on Finance of the City of Taunton for the year 1905
Duly recorded and countersigned
Howard M. Kingsley
City Clerk.

Face of a Bond

This Indenture Witnesseth, That the Mortgagor,

Willis M. Kent

of the City of Galesburg in the County of Knox and State of Illinois **Mortgage and Warrant**, to Abel C. Goldberg of the City of Chicago, County of Cook and State of Illinois to secure the payment of a certain promissory note executed by Willis M. Kent bearing even date herewith, payable to the order of Abel C. Goldberg the following described real estate, to wit: the North-east Quarter (N. E. 1/4) of the South-west Quarter (S. W. 1/4) of Section Nineteen (19) in Township Eleven (11) North, Range one (1) East of the Fourth Principal Meridian, situated in the County of Knox in the State of Illinois, hereby releasing and waiving all rights under and by virtue of the Homestead Exemption Laws of the State of Illinois, and all right to retain possession of said premises after any default in payment or breach of any of the covenants or agreements herein contained.

And it is Expressly Provided and Agreed, That if default be made in the payment of the said promissory note, or of any part thereof, or the interest thereon, or any part thereof, at the time and in the manner above specified for the payment thereof, or in case of waste or non-payment of taxes or assessments on said premises, or of a breach of any of the covenants or agreements herein contained, then and in such case the whole of said principal sum and interest, secured by the said promissory note in this mortgage mentioned, shall thereupon, at the option of the said mortgagee, his heirs, executors, administrators, attorneys or assigns, become immediately due and payable: And this mortgage may be immediately foreclosed to pay the same by said mortgagee, his heirs, executors, administrators, attorneys or assigns: And it shall be lawful for the said mortgagee, his heirs, executors, administrators, attorneys or assigns, to enter into and upon the premises hereby granted, or any part thereof, and to receive and collect all rents, issues and profits thereof.

Upon the Filing of any Bill To foreclose this mortgage in any Court having jurisdiction thereof, such Court may appoint Arthur M. Thompson or any proper person receiver, with power to collect the rents, issues and profits arising out of said premises during the pendency of such foreclosure suit, and until the time to redeem the same from any sale that may be made under any decree foreclosing this mortgage shall expire: and such rents, issues and profits when collected may be applied toward the payment of the indebtedness and costs herein mentioned and described. And upon the foreclosure and sale of said premises, there shall be first paid out of the proceeds of such sale all expenses of advertisement, selling and conveying said premises, and one hundred dollars attorneys' or solicitors' fees, to be included in the decree, and all moneys advanced for taxes, assessments and other liens; then there shall be paid the principal of said note whether due and payable by the terms thereof or not, and the interest thereon.

Dated, This 20th day of July A. D. 19 25

Willis M. Kent. {Seal}

{Seal}

{Seal}

The rate of the interest is often quite low because the lender would often prefer to lend his money at a low rate of interest to a borrower who is sure to be able to pay than at a higher rate to one whose ability is not so certain.

When individuals wish to borrow money for a period of years, they usually give a mortgage on some property that

State of ----Illinois----
County of ----Knox----
SS.

I, ----------Ferdinand W. Levine----------

----------a notary public---------- in and for said County, in the State aforesaid, Do Hereby Certify, That---Willis M. Kent---

personally known to me to be the same person--whose name----is---- subscribed to the foregoing instrument, appeared before me this day in person, and acknowledged that---he---signed, sealed and delivered the said Instrument as----his----free and voluntary act, for the uses and purposes therein set forth, including the release and waiver of the right of homestead.

Given under my hand and----------seal, this --------20th--------day of----------July.----------A. D. 19 25

[Notary's Seal]

Ferdinand W. Levine
Notary Public

End of Mortgage Form given on Page 370

they own. A **mortgage** is a promise by the borrower to give the lender a part of his property if he does not pay the principal and interest at the times stated.

A person who is known to be honest and to have ability to pay can borrow a reasonable amount of money for periods ranging from 30 to 90 days without further security than his promissory note. In such cases the man's "word is as good as his bond." If the borrower is not known to be honest, or if it is not certain that he has

the ability to pay back a loan, he must get some other person or persons who are known to the bank or lender, to sign his promissory note with him. To put your name on someone else's note is called "going security for him." It means that you promise to pay the note if the borrower does not do so. It pays to be careful in such matters.

Loans for short periods usually draw 6% or 7% interest. When it is time to pay the note and the borrower is not ready to pay, it is usually possible to renew the note by paying the interest which is due. When a note is renewed, the old note is returned to the borrower and a new one made out and signed by him.

On some notes no definite time is stated, but the phrase "on demand" is inserted. This means that the note must be paid or renewed whenever the lender asks. Such notes are usually renewed at the end of 90 days at most.

On long-time loans the interest is usually paid either **annually** or **semiannually**. By semiannually we mean

---

1. The three Jones brothers went nutting after school. Ted got $\frac{3}{4}$ bushel, Bill $2\frac{1}{2}$ pecks, Tom $1\frac{3}{4}$ pecks. How many pecks did the boys get all together?

2. How many rods are there in 66 yards?

3. How many square rods are there in 1.892 acres?

4. Mr. Nelson bought 28.4 acres of land at $24.00 per acre. After 8 years he sold the tract at $36 per acre. What per cent had the land gained in value?

5. How many ounces are there in $3\frac{3}{8}$ pounds?

6. How many square feet are there in $69\frac{1}{3}$ square yards?

7. How many rods are there in 3025 square yards?

every six months. The time for the payment of interest is always stated in the note. It is assumed that the interest is to be paid once a year unless there is a statement to the contrary.

Suppose you had borrowed or loaned some money and wanted to know how much interest should be paid. This is the way to find out.

Problem. Find the interest on \$1500.00 at 6% for one year.

The interest on \$1500.00 for one year at 6% would be 6% of \$1500.00, or \$90.00.

Solve the following examples in the same manner.

Find the interest for one year on each of the following amounts at the rate given:

(1)	(2)
(*A*) \$400 at 7%	\$1500 at 3.25%
(*B*) \$2000 at 3.5%	\$25 at 7%
(*C*) \$800 at 5%	\$500 at 6%
(*D*) \$10000 at 4.75%	\$2500 at 4%
(*E*) \$250 at 7%	\$700 at 5.5%

Find the answers:

(1)	(2)	(3)
(*A*) $\frac{7}{9}$ of 403.012	$.09\overline{)20.142}$	$.008 \times ? = .518$
(*B*) $\frac{4}{7}$ of \$363.16	$.8\overline{)6.0216}$	$.9 \times ? = 614.232$
(*C*) $\frac{3}{8}$ of 7031.53	$.04\overline{)2}$	$3\overline{).918}$
(*D*) $116 - 27 = ?$	$64 + 7 = ?$	$1000 - 544 = ?$

Short-time loans usually run 30, 45, 60, or 90 days. To find the interest in such cases we first find the interest for one year. We think of one year as 360 days. Then we figure out for what part of a year the interest is to be paid.

Learn these facts if you do not already know them.

30 days (da.) $= \frac{1}{12}$ year (yr.)	45 da. $= \frac{1}{8}$ yr.
60 da. $= \frac{1}{6}$ yr.	90 da. $= \frac{1}{4}$ yr.

Problem. Find the interest on \$150.00 for 90 days at 7%.

The interest on \$150.00 at 7% for one year is \$10.50. Ninety days is $\frac{1}{4}$ year, so the interest on \$150.00 for 90 days would be $\frac{1}{4}$ of \$10.50, or \$2.63. (When there is a fraction of a cent in the answer, add one cent more.)

1. The Brown family bought a bill of goods to take with them to their summer cottage.

1 football, \$4.75
4 bathing suits at \$2.98 each
1 flashlight, \$1.80
5 lb. chocolate bittersweets at 80 cents per pound
1 ukelele, \$2.65
1 song book, \$1.27
2 tennis rackets at \$3.25 each
1 canoe, \$65.25

Find the total cost of their goods.

2. James Finley is 6 feet tall. His sister is $4\frac{1}{12}$ feet tall. How much taller is James than his sister?

3. Twelve quarts of brick ice cream will serve 8 persons. How many persons will 24 bricks serve?

Find the interest at 7% on each of the following amounts for the time given:

(1)	(2)
(*A*) \$50.00 for 60 days	\$100.00 for 45 days
(*B*) \$75.00 for 30 days	\$250.00 for 30 days
(*C*) \$250.00 for 30 days	\$175.00 for 60 days
(*D*) \$25.00 for 45 days	\$225.00 for 90 days
(*E*) \$450.00 for 60 days	\$500.00 for 30 days

Problem. Find the interest on \$10000 for 26 days at 7%.

The interest on \$10,000 for one year at 7% is \$700.00. Twenty-six days is $\frac{26}{360}$ of a year; so we get $\frac{26}{360}$ of \$700.

$$\frac{26}{\cancel{360}\ 18} \times \frac{\overset{\$35}{\cancel{\$700}}}{1} = \frac{26 \times \$35}{18} = \frac{\$910}{18} = \$50.55$$

\$50.55 is the interest on \$10,000 for 26 days at 7%.

Find the sums:

1	2	3	4	5
4.190	451.0	20.00	3.210	.3480
4.809	666.8	79.97	9.545	.8833
2.963	707.7	28.52	3.976	.8938
8.326	672.7	95.72	6.317	.1494
6.049	189.4	20.80	4.786	.7570
4.670	607.2	19.66	4.235	.5106
7.509	111.2	52.27	3.746	.2024

6. Five per cent of Mr. Owen's oranges spoiled. What per cent of them were good?

Find the interest at 7% on each of the following amounts for the time given:

	(1)	(2)
(*A*)	\$1000 for 47 days	\$6500 for 29 days
(*B*)	\$5000 for 35 days	\$23000 for 11 days
(*C*)	\$10000 for 13 days	\$35000 for 9 days
(*D*)	\$7500 for 28 days	\$22500 for 17 days
(*E*)	\$15000 for 13 days	\$9875 for 14 days

When notes are written to be paid on demand or when the borrower fails to pay his interest on time it is necessary to find the interest for odd times.

Problem. Find the interest on \$500 for 1 year 3 months 15 days at 6%.

The interest on \$500.00 for 1 year at 6% is \$30.00. The interest for 1 month would be $\frac{1}{12}$ of \$30.00, or \$2.50, and the interest for 3 months would be $3 \times \$2.50$, or \$7.50.

1. Find the area of a rectangle $5\frac{1}{3}' \times 12\frac{5}{6}'$.

2. How many square rods are there in 1600 square yards?

3. Mr. Worley's potatoes have been weighing 59.6 pounds to the bushel. How many bushels are there in a load of these potatoes that weighs 2235 pounds?

4. How many pounds are there in 54 ounces?

5. Find the product of 78.94×46.7.

6. Mrs. Morehead weighed 165 pounds before her illness. Now she weighs only 143 pounds. What per cent of her weight did she lose?

Fifteen days is $\frac{1}{2}$ month; so the interest on \$500.00 at 6% for 15 days would be $\frac{1}{2}$ of \$2.50, or \$1.25.

Interest for 1 year	\$30.00
Interest for 3 months	7.50
Interest for 15 days	1.25
	\$38.75 *Ans.*

Find the interest on:

1. \$400 for 2 yr. 6 mo. 10 da. at 5%.
2. \$800 for 4 yr. and 15 da. at 7%.
3. \$650 for 1 yr. 9 mo. and 20 da. at 6%.
4. \$250 for 8 mo. and 18 da. at 7%.
5. \$700 for 3 yr. 6 mo. at 6%.
6. \$500 for 2 yr. 4 mo. 15 da. at 7%.
7. \$750 for 1 yr. 3 mo. 10 da. at 5%.
8. \$600 for 9 mo. 15 da. at 6%.

Find the differences:

1	2	3	4	5
162.4	.1314	1.151	19.43	.9433
96.7	.0578	.506	9.88	.4005

6. Find the total cost of these furnishings for a sun parlor:

1 bird cage, \$3.48
1 fernery, \$15.59
18 yd. cretonne at \$1.00 per yard
1 desk and chair, \$28.00
2 chairs at \$23.28 each

7. Find $4\frac{1}{2}$% of \$400.

Practice Exercises

1. How many gallons are there in 25.2 quarts?

2. Donald Bain is reading "Treasure Island." He has been averaging $20\frac{4}{5}$ pages per hour. The book contains 324 pages. Donald has read for 4 hours. How long will it take him to finish the book at the rate at which he has been reading?

3. What is $\frac{4}{5}$ of 18000?

4. A turkey weighed $18\frac{3}{4}$ pounds and was sold at 75 cents per pound. How much money did the turkey bring?

5. How many quarts are there in 81.2 pints?

6. Mrs. Roark bought $8\frac{3}{4}$ pounds of bacon for $6.45. How much did she pay per pound for the bacon?

7. Find the total of this bill:

2 heads lettuce at $12\frac{1}{2}¢$ each
2 lb. turnips at $.04 per pound
2 lb. Tokay grapes at $12\frac{1}{2}¢$ per pound
1 basket grapes at $35¢$
$1\frac{1}{2}$ lb. trout at $35¢$ per pound
1 broom at $1.10

8. Mr. Barnes and Mr. Loken estimated the distance across a lake. Mr. Barnes's estimate was 7 miles, and Mr. Loken's estimate was $3\frac{1}{2}$ miles. The correct distance was 5.4 miles. Which man made the better estimate? How much better?

9. Which is cheaper, to buy 16 street-car tickets for $1.00 or to ride 16 times at 8 cents, regular fare? How much cheaper is it?

10. Thirty-six packages of cereal are shipped in a box. Each package weighs 12 ounces. How many pounds and ounces do 36 packages weigh?

Compound Interest

When money is loaned at simple interest, the interest may be payable when the money is received or at some date later on. If the money is borrowed for more than one year, the interest must usually be paid at least once a year from the beginning. In some cases, however, the persons who lend the money do not want to collect the interest when it is due. They prefer to have it added to the principal at the end of each interest period. According to this plan the principal gets larger all the time and the interest is said to **accumulate.** When money is lent in this way, it is said to be lent at **compound interest.** Savings accounts usually draw interest in this way. The table on page 381 shows how a dollar will increase in value when it is lent at **compound** interest.

Find the totals:

1	2	3	4
			5.658
$9.99	$3.52	2528 miles	7.646
8.71	9.97	5735 miles	5.816
7.69	6.97	4999 miles	9.670
4.27	8.80	5633 miles	7.453
.98	9.75	4098 miles	3.220

5. The gross weight of a load of coal was 6124 pounds. The tare was 2242 pounds. What was the net weight?

The gross weight is the weight of truck and load; the tare is the weight of the empty truck; the net weight is the weight of the load itself.

Using the table on page 381, find how much one dollar will amount to in each of the following cases:

	(1)	(2)
(*A*)	In 10 years at 6%	In 11 years at 7%
(*B*)	In 5 years at 8%	In 13 years at 5%
(*C*)	In 7 years at $4\frac{1}{2}$%	In 17 years at 6%
(*D*)	In 18 years at 4%	In 19 years at $4\frac{1}{2}$%
(*E*)	In 20 years at 2%	In 6 years at 5%

In the table on page 381 the compound interest is counted as paid every year, or it is said to be payable annually. On savings accounts the compound interest is payable every 6 months, or semiannually.

The table on page 382 shows how your savings account increases when you put money in the account each month. The interest is compounded semiannually at 3%.

1. Mr. Block's back yard is $7\frac{1}{3}$ yards long and $16\frac{1}{2}$ feet wide. How many square feet are there in the yard?

2. An article listed at $15.87 is offered for sale at 25% off. What is the net price?

3. Our city blocks are 440 feet long. It is 5 blocks from the post office to the Emerson School. What part of a mile is that?

4. Mr. Acres gets 7% commission on the goods that he sells. What will his commission be on 2000 dollars' worth of goods sold?

5. The enrollment of our school is 878. The average daily attendance last month was 835. What was the per cent of absence from the school?

How One Dollar Increases at Compound Interest

Year	2%	4%	4½%	5%	6%	7%	8%	Year
1	$1.020	$1.040	$1.045	$1.050	$1.060	$1.070	$1.080	1
2	1.040	1.081	1.092	1.102	1.123	1.144	1.166	2
3	1.061	1.124	1.141	1.157	1.191	1.225	1.259	3
4	1.082	1.169	1.192	1.215	1.262	1.310	1.360	4
5	1.104	1.216	1.246	1.276	1.338	1.402	1.469	5
6	1.126	1.265	1.302	1.340	1.418	1.500	1.586	6
7	1.148	1.315	1.360	1.407	1.503	1.605	1.713	7
8	1.171	1.368	1.422	1.477	1.593	1.718	1.850	8
9	1.195	1.423	1.486	1.551	1.689	1.838	1.999	9
10	1.218	1.480	1.552	1.628	1.790	1.967	2.158	10
11	1.243	1.539	1.622	1.710	1.898	2.104	2.331	11
12	1.268	1.601	1.695	1.795	2.012	2.252	2.518	12
13	1.293	1.665	1.772	1.885	2.132	2.409	2.719	13
14	1.319	1.731	1.851	1.979	2.260	2.578	2.937	14
15	1.345	1.800	1.935	2.078	2.396	2.759	3.172	15
16	1.372	1.872	2.022	2.182	2.540	2.952	3.425	16
17	1.400	1.947	2.113	2.292	2.692	3.158	3.700	17
18	1.428	2.025	2.208	2.406	2.854	3.379	3.996	18
19	1.456	2.106	2.307	2.526	3.025	3.616	4.315	19
20	1.485	2.191	2.411	2.653	3.207	3.869	4.660	20

Find the sums of these columns:

1	2	3	4	5
117.2	15.31	1.387	9.32	.974
87.5	9.84	.400	2.33	.485
691.7	58.35	3.495	7.85	.329
346.9	62.49	6.358	6.29	.498
25.8	29.71	7.424	3.44	.567

6. Mrs. White had $186.35 in the bank. She drew out $96.70 and bought a bond. What per cent of her money remained in the bank?

How Monthly Savings Increase in a Savings Account Compounded Semiannually at 3%

	1 Year	2 Years	3 Years	4 Years	5 Years	6 Years	7 Years	8 Years
$1	12.19	24.75	37.67	51.00	64.72	78.85	93.41	108.42
$2	24.38	49.50	75.34	102.00	129.44	157.70	186.82	216.84
$3	36.57	74.25	113.01	153.00	194.16	236.55	280.23	325.26
$4	48.76	99.00	150.68	204.00	258.88	315.40	373.64	433.63
$5	60.95	123.75	188.35	255.00	323.60	394.25	467.05	542.10
$6	73.14	148.50	226.02	306.00	388.32	473.10	560.46	650.52
$7	85.33	173.25	263.69	357.00	453.04	551.95	653.87	758.94
$8	97.52	198.00	301.36	408.00	517.76	630.80	747.28	867.36
$9	109.71	222.75	339.03	459.00	582.48	709.65	840.69	975.78
$10	121.90	247.50	376.70	510.00	647.20	788.50	934.10	1084.20
$11	134.09	272.25	414.37	561.00	711.92	867.35	1027.51	1192.62
$12	146.28	297.00	452.04	612.00	776.64	946.20	1120.92	1301.04
$13	158.47	321.75	489.71	663.00	841.36	1025.05	1214.33	1409.46
$14	170.66	346.50	527.38	714.00	906.08	1103.90	1307.74	1517.88
$15	182.85	371.25	565.05	765.00	970.80	1182.75	1401.15	1626.30
$16	195.04	396.00	602.72	816.00	1035.52	1261.60	1494.56	1734.72
$17	207.23	420.75	640.39	867.00	1100.24	1340.45	1537.97	1843.14
$18	219.42	445.50	678.06	918.00	1164.96	1419.30	1681.38	1951.56
$19	231.61	470.25	715.73	969.00	1229.68	1498.15	1774.79	2059.98
$20	243.80	495.00	753.40	1020.00	1294.40	1577.00	1868.20	2168.40

The left-hand column shows the amount of money put in the bank each month.

Using the table on this page, tell how much each of the following sums of money will amount to in the period of time stated. The first example is answered for you.

Sums of Money per Month	Time	Amount
1. $5.00	5 years	$323.60
2. $1.00	8 years	?
3. $10.00	7 years	?

Sums of Money per Month	Time	Amount
4. $3.00	6 years	?
5. $7.00	4 years	?
6. $6.00	8 years	?
7. $2.00	7 years	?
8. $4.00	3 years	?
9. $8.00	2 years	?
10. $9.00	1 year	?

Bank Discount

Bankers make their living by lending money. Most of their loans are for short periods. Suppose, for example, that you needed $50.00 for a year. If you are known to be honest and able to pay your debts, your bank will be glad to lend you that amount for 90 days. Sometimes a bank will allow you to take the money and will expect you to pay the interest at the end of 90 days. Then they will lend you the money for another 90 days and so on until you are ready to pay all of the $50.00.

Find the quotients:

	(1)	(2)	(3)	(4)
(*A*)	$9\overline{)1.8}$	$.08\overline{)4.32}$	$.6\overline{)2}$	$.05\overline{)5}$
(*B*)	$.09\overline{)98334}$	$.8\overline{)13.44}$	$9\overline{)7.3701}$	$20\overline{).6}$
(*C*)	$400\overline{)108}$	$.9\overline{)1014.66}$	$.6\overline{).018}$	$7\overline{)3.5}$

1. Grace Dalton has $30.82. How long will this amount last if she spends $6.70 per week?

Most banks, however, require the interest to be paid in advance. That is, if you asked for \$50 you would not get quite as much as that. The bank would compute the interest on \$50 for 90 days and subtract this interest from \$50. They would then let you have the remainder. Bankers usually describe this procedure by saying that they **discount** your note for you. The **amount** of the discount is the amount of the interest. This sort of discount is called **bank discount.** The remainder of the principal is called the **proceeds.**

Problem. Find the discount and proceeds on a note for \$50.00 for 90 days at 7%.

The interest on \$50.00 for one year at 7% is \$3.50. Since 90 days is $\frac{1}{4}$ of a year, the interest for 90 days will be $\frac{1}{4}$ of \$3.50, or 88 cents. Eighty-eight cents is the bank discount. The proceeds are \$50.00 less 88 cents, or \$49.12.

1. How far can a tractor travel in 8 hours if it averages 9.52 miles per hour?

2. How many pints are there in 6.23 quarts?

3. The Blue Bird Club had a picnic hike. Their bill for food was as follows:

$\frac{1}{6}$ lb. coffee at 45¢ per pound
16 pickles at 15¢ a dozen
$\frac{3}{8}$ lb. butter at 58¢ per pound
2 loaves bread at $12\frac{1}{2}$¢ each
$1\frac{1}{4}$ lb. wienerwurst at 25¢ per pound

What was the total of their bill?

4. How many quarts are there in 7.84 pecks?

Find the discount and proceeds for each of the following notes at 7%:

	(1)	(2)
(*A*)	\$400 for 60 days	\$75 for 30 days
(*B*)	\$10000 for 15 days	\$800 for 20 days
(*C*)	\$8000 for 30 days	\$15000 for 11 days
(*D*)	\$1500 for 45 days	\$8000 for 23 days
(*E*)	\$650 for 90 days	\$50000 for 17 days
(*F*)	\$475 for 60 days	\$35000 for 37 days

Bankers also make a practice of discounting notes that have only part of their time yet to run. For example, Mr. Jones bought a new automobile but lacked \$600 of having enough money to pay for it. The automobile dealer took Mr. Jones's note for the money. Several weeks later the automobile dealer needed money, so he took the note to the bank. The bank discounted it for the remainder of the time which the note had to run and gave the automobile dealer the balance. Mr. Jones's note then belonged to the

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1. A football listed at \$4.75 was sold at \$4.00. What was the per cent of discount?
2. How many quarts are there in $2\frac{3}{4}$ gallons?
3. How many inches are there in .9 foot?
4. How many rods are there in 73.4 yards?
5. How many feet are there in 7.34 yards?
6. The city library lent 547 books during March. Of these, 373 books were fiction for grown people, 98 were children's books, and the remainder were books on general subjects. What per cent of each kind of books was lent?

bank. He paid the interest and principal to the bank instead of to the automobile dealer. Banks have money problems of this sort to solve.

Commission

Sometimes in buying and selling it is cheaper or more convenient to have someone else do the buying or selling for you. For example, a produce dealer may wish to ship 200 dozen eggs to be sold, but he cannot leave his business long enough to take the eggs to the city himself. A merchant may also wish to buy a consignment of goods in a large city, but he has neither the money nor the time to make the trip. A man may wish to sell his farm or home and has not time to hunt up a buyer, or a man may wish to buy a farm or home and be unable to find one. In such cases it is customary to hire another person to buy or sell for you. This person is called an agent. The men who buy and sell land for others are called real estate agents. The men who buy and sell goods in the city for people who live outside of the city are called commission merchants. All such agents are paid for their services a certain per cent of the total amount of the money handled. The money which they receive is called **commission.**

1. How many inches are there in .036 mile?
2. How many quarts are there in 7.8 pecks?
3. How many minutes are there in 7.9 hours?
4. How many square feet are there in 691 square yards?
5. How many square rods are there in .412 acre?
6. How many ounces are there in 5.6 pounds?

Problem. Mr. Drake shipped 200 dozen eggs to a commission merchant in Chicago to be sold. The commission merchant sold the eggs at 35 cents a dozen. His commission was 10%. How much money did the merchant receive for his work?

200 dozen eggs at 35 cents a dozen amounts to $70.00.

10% of $70.00 is $7.00, which is the amount of the agent's commission.

Find the commission on each of the following sales:

1. 5000 dollars' worth of furniture at 5% commission.

2. A farm containing 160 acres sold at $150.00 an acre with 3% commission.

3. 100 bags each weighing 250 pounds on the average sold at $6\frac{1}{2}$ cents a pound with 4% commission.

4. A house and lot sold for $14000 at 2% commission.

5. 16 tons of potatoes sold at $3.90 a hundred pounds with commission at 4%.

6. 2000 barrels of apples sold at $5.00 a barrel with commission at $3\frac{1}{2}$%.

7. 1500 bales of cotton sold at $19.75 per bale with commission at $2\frac{1}{2}$%.

8. 2000 bushels of wheat at $\$1.79\frac{3}{4}$ a bushel with commission $3\frac{3}{4}$%.

9. 3500 bushels of No. 3 yellow corn at $77\frac{3}{4}$ cents a bushel with commission at 3%.

10. 500 yards of gray goods at $8\frac{3}{4}$ cents a pound with commission at 8%. (Count 5.35 yards to the pound.)

CHAPTER IX

RATIO, DENOMINATE NUMBERS, MEASUREMENTS

RATIO

Some Things to Do

We often wish to compare two or more numbers. For example, one day William and Harry were talking about how many marbles they had. William said that he had more marbles than Harry had. When they counted them William had 18 and Harry had 6. Then William said, "I have three times as many as you have, Harry." Was he right? Just about that time John came along. He had some marbles also. He took them out of his pocket and counted them. He had exactly 12 marbles. He said: "Harry, I have twice as many marbles as you have. I can lay my marbles down two at a time while you lay yours down one at a time, and I can keep on putting marbles down as long as you can." Was he right?

Give 12 pasteboard squares to one boy and 6 to another. Play that the pasteboard squares are marbles. Prove that John was right. William said that he believed that he could lay three marbles down every time that Harry laid down one. Use your pasteboard squares and prove whether William was right or not. John then said to William, "I can put down two marbles six times and you can put down three marbles six times. That means that

I can put down two marbles every time you put down three." William replied, "If that is the case I have $1\frac{1}{2}$ times as many marbles as you have." Were John and William both right in what they said? Prove your answers. Use squares for marbles if necessary. These boys were comparing the numbers 6, 12, and 18. They found that 12 is twice as many as 6, and that 18 is three times as many as 6 and $1\frac{1}{2}$ times as many as 12.

In arithmetic we may say this by using a new word, one that you may not have heard before. The new word is **ratio**. Instead of saying that 12 is twice as many as 6, we may say that the ratio of 12 to 6 is 2 to 1. In like manner we may say the ratio of 18 to 6 is 3 to 1 and the ratio of 18 to 12 is $\frac{3}{2}$, or $1\frac{1}{2}$. To save time we often use a new sign to keep from writing so many words. Instead of writing "the ratio of 12 to 6" we write 12 : 6. In like manner the ratio of 18 to 6 may be written 18 : 6.

The sign : means the same as the sign of division. It would be just as true to write $12 \div 6$, $18 \div 6$, $18 \div 12$. There is still another way to write ratios that is familiar to you. We can write $\frac{12}{6} = 2$; $\frac{18}{6} = 3$; $\frac{18}{12} = \frac{3}{2}$, or $1\frac{1}{2}$.

Read the following ratios:

	(1)	(2)	(3)	(4)
(*A*)	9 : 6	400 : 600	4 : 1	3 : 5
(*B*)	600 : 100	1 : 5	3 : 2	500 : 2000
(*C*)	1 : 4	$7\frac{1}{2}$: 5	2 : 3	400 : 2000
(*D*)	400 : 500	6 : 1	75 : 25	1000 : 225
(*E*)	3 : 2	3 : 1	4 : 5	$37\frac{1}{2}$: $62\frac{1}{2}$

Ratios occur very frequently in conversation and writing. You have often heard statements like these: "The motion carried 2 to 1." "The chances are 3 to 1 that our team will win." "A wreck on our line does not happen once in a thousand times." "Such a storm does not come more than twice in a hundred years." "It was the opportunity of a lifetime." "Put in two parts of flower seed to one part of water." "Concrete is made by using two parts of sand, three parts of gravel, and one part of cement."

Per cents are ratios also. Twenty per cent means 20 parts out of 100; 6 per cent means 6 parts out of 100; and so on. Perhaps you have never thought of a per cent as a ratio before. That is because the ratio in per cents is hidden so that you cannot see it at first. Ratios are hidden also in "What Part Of" and "How Many Times" exercises. Do you remember how to solve these exercises?

"What Part Of" Exercises

The "What Part Of" exercises are worked like this.

Example. What part of 36 is 24?

We make a fraction out of the two numbers. We always put the *larger number underneath.* Then we change the fraction to its lowest terms.

$$12 \left| \frac{24}{36} = \frac{2}{3} \right.$$

Work the following exercises in a similar manner:

1. 75 is what part of 100?

2. 60 is what part of 360?

3. 90 is what part of 180?

4. 45 is what part of 60?

5. 880 is what part of 5280?
6. 120 is what part of 160?
7. 1512 is what part of 1728?
8. 96 is what part of 144?
9. 132 is what part of 231?
10. 24 is what part of 32?
11. 875 is what part of 1000?
12. 50 is what part of 75?
13. 48 is what part of 64?
14. 27 is what part of 72?
15. 40 is what part of 128?
16. 60 is what part of 144?
17. 42 is what part of 96?
18. 63 is what part of 108?
19. 75 is what part of 90?

Find the totals:

1	2	3	4	5
$78.90	456.2	.2132	8.892	895.0
23.42	445.4	.8896	5.237	457.4
17.65	623.8	.4668	2.356	323.0
94.76	395.5	.6125	6.124	545.7
13.08	432.6	.4353	3.062	276.7
12.46	254.2	.3535	5.445	403.4
85.07	855.7	.8844	5.908	524.8
74.85	336.4	.1235	2.962	221.7

6. What is $\frac{3}{4}$ of 2150.4?
7. What part of 4.5 is 3?
8. $56 \times 199 = ?$
9. Find the cost of $4\frac{3}{4}$ dozen ears of sweet corn at 45¢ per dozen.
10. Divide 5963 by 67.

"How Many Times" Exercises

We solve "How Many Times" exercises in much the same way as "What Part Of" exercises, but there are one or two very important differences. When we make the fraction, we always put the *larger number on top.*

Example. Sixty-four is how many times 48?

We write $\frac{64}{48} = 1\frac{16}{48}$.

$$16 \,\Big|\, \frac{16}{48} = \frac{1}{3}.$$

Hence, 64 = $1\frac{1}{3}$ times 48.

Work the following exercises in a similar way. Write the answers in your tablet. Do not write them in your book.

1. 480 = how many times 12?
2. 468 = how many times 144?
3. 1000 = how many times 875?
4. 100 = how many times 75?

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1. On an examination in arithmetic 10 pupils got A, 36 got B, 84 got C, 32 got D, and 11 failed. What per cent of the pupils got A? What per cent got B? C? D? What per cent failed?

2. If 50 postage stamps sell at $1.00, what is the price of 25 postage stamps?

3. Grace Bawser earned $76.04 in 6 weeks. At that rate what amount should Grace earn in 15 days?

4. The sixth-grade pupils are planning to give their teacher a bottle of perfume on her birthday. The perfume will cost $3.00. They have already collected $2.00. What per cent of the total amount remains to be collected?

5. 5280 = how many times 3960?
6. \$75 = how many times \$50?
7. 100 = how many times 3?
8. 100 = how many times 6?
9. 15 = how many times 2?
10. 20 = how many times 8?
11. \$5.00 = how many times \$1.75?
12. 80 = how many times 12?
13. 100 = how many times 16?
14. 100 = how many times 8?
15. 100 = how many times 12?
16. 360 = how many times 45?
17. 70 = how many times 8?
18. 50 = how many times 4?
19. 40 = how many times 6?

Find the differences:

	(1)	(2)	(3)	(4)	(5)
(*A*)	90.0	42.11	1.111	6.454	.8555
	69.9	36.66	.909	3.668	.3908
(*B*)	.4403	87.66	1.087	783.0	1872.2
	.1097	10.99	.368	113.3	899.3

1. A bicycle which was listed at \$50 was sold for \$45. What was the per cent of discount?

2. What is the price of one pound of butter when $7\frac{1}{2}$ pounds of butter cost \$4.20?

3. How many feet are there in .4 of a mile?

Changing Ratios to Their Simplest Forms

Ratios are much like fractions. You have already learned that fractions may often be reduced to their lowest terms by dividing both numerator and denominator by the same number. In a ratio the first number, or term, corresponds to the numerator and the second to the denominator. Therefore we can often change a ratio to its simplest form or lowest terms by dividing both numbers of the ratio by the same divisor.

Example (*A*). Change 24 : 18 to its simplest form.

We see at once that we can divide both 24 and 18 by 6. $24 \div 6 = 4$; $18 \div 6 = 3$. Therefore $24 : 18 = 4 : 3$.

Change the following ratios to their simplest forms:

1. 28 : 14. **3.** 18 : 15. **5.** 63 : 45. **7.** 18 : 72.

2. 36 : 24. **4.** 27 : 21. **6.** 28 : 56. **8.** 16 : 24.

9. 8 : 12. **10.** 42 : 63.

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1. Which is cheaper, to buy fudge at 80¢ per pound or to make it? The cost of making one pound of fudge is as follows:

1 lb. sugar, 8¢
$\frac{1}{4}$ qt. milk at 10¢ per quart
$\frac{1}{8}$ lb. chocolate at 50¢ per pound
$\frac{1}{16}$ lb. butter at 60¢ per pound
1 hr. work, 60¢

How much cheaper is it?

2. How many sacks of flour can be bought for $175.68 if each sack costs $3.66?

3. Mrs. Jones had $120.00. She now has $50.00. What per cent of her money has she spent?

Example (*B*). Change $2\frac{1}{2} : 7\frac{1}{2}$ to its simplest form.

This ratio is not in its simplest form, because it has a fraction in it. You have learned that the value of a fraction is not changed if you multiply both its numerator and its denominator by the same number. The same is true of ratios when you multiply both terms of a ratio by the same number. You can get rid of the fraction in the ratio $2\frac{1}{2} : 7\frac{1}{2}$ by multiplying both numbers by 2.

$$2 \times 2\tfrac{1}{2} = 5 \qquad 2 \times 7\tfrac{1}{2} = 15$$

Hence, $$2\tfrac{1}{2} : 7\tfrac{1}{2} = 5 : 15.$$

The ratio is not yet in its simplest form, because we can divide both terms by 5.

$$5 \div 5 = 1 \qquad 15 \div 5 = 3$$

Hence, $$5 : 15 = 1 : 3.$$

That is, $2\frac{1}{2} : 7\frac{1}{2} = 1 : 3$. So $1 : 3$ is the simplest form of $2\frac{1}{2} : 7\frac{1}{2}$.

Find the products:

1	2	3	4	5
136.87	7863.1	9.78	5.231	9875
50.6	.678	.87	23.1	.045

6. John Grimes is $13\frac{1}{2}$ years old. His father is $37\frac{1}{3}$ years old. Find the difference in their ages.

7. How many newspapers are needed to supply 47 newsboys if each boy has 235 subscribers?

8. Find the sum of 1232 pounds, 2623 pounds, 1366 pounds, and 1878 pounds.

Change the following ratios to their simplest forms:

1. $3\frac{1}{3} : 10$. 3. $33\frac{1}{3} : 66\frac{2}{3}$. 5. $12\frac{1}{2} : 100$. 7. $21 : 3\frac{1}{2}$.
2. $1\frac{3}{4} : 8\frac{3}{4}$. 4. $16\frac{2}{3} : 50$. 6. $50 : 11\frac{1}{9}$. 8. $62\frac{1}{2} : 37\frac{1}{2}$.
9. $6\frac{1}{4} : 1\frac{1}{4}$. 10. $10\frac{2}{3} : 2\frac{2}{3}$.

Example (*C*). Change $18\frac{3}{4} : 2\frac{1}{2}$ to its simplest form.

$$4 \times 18\tfrac{3}{4} = 75 \qquad 4 \times 2\tfrac{1}{2} = 10$$

$$18\tfrac{3}{4} : 2\tfrac{1}{2} = 75 : 10$$

$$75 \div 5 = 15 \qquad 10 \div 5 = 2$$

$$75 : 10 = 15 : 2$$

Therefore $18\frac{3}{4} : 2\frac{1}{2} = 15 : 2$.

That is, $15 : 2$ is the simplest form of $18\frac{3}{4} : 2\frac{1}{2}$.

In this example both terms of the ratio contained fractions and the fractions had different denominators. We got rid of both fractions, however, by multiplying both numbers by 4. This gave $75 : 10$, which we changed further by dividing both numbers by 5.

Change the following ratios to their simplest forms:

1. $1\frac{3}{4} : 10\frac{1}{2}$. 3. $1\frac{1}{6} : 9\frac{1}{3}$. 5. $12\frac{1}{2} : 18\frac{3}{4}$. 7. $3\frac{1}{16} : 18\frac{3}{8}$.
2. $\frac{5}{8} : 1\frac{1}{4}$. 4. $16\frac{2}{3} : 4\frac{1}{6}$. 6. $2\frac{1}{12} : 1\frac{2}{3}$. 8. $11\frac{1}{9} : 8\frac{1}{3}$.
9. $9\frac{1}{6} : 5\frac{1}{2}$. 10. $1\frac{3}{4} : 7\frac{1}{3}$.

Example (*D*). Change $\frac{1}{2} : \frac{1}{3}$ to its simplest form.

$$6 \times \tfrac{1}{2} = 3 \qquad 6 \times \tfrac{1}{3} = 2$$

Therefore $\frac{1}{2} : \frac{1}{3} = 3 : 2$

We got rid of both fractions by multiplying both terms of the ratio by 6.

Change the following ratios to their simplest forms:

1. $2\frac{1}{2}:3\frac{1}{3}$. **3.** $\frac{5}{6}:\frac{3}{4}$. **5.** $6\frac{1}{4}:5\frac{5}{9}$. **7.** $1\frac{2}{3}:\frac{5}{8}$.

2. $3\frac{1}{4}:4\frac{1}{3}$. **4.** $7\frac{1}{2}:1\frac{1}{9}$. **6.** $\frac{2}{3}:\frac{1}{8}$. **8.** $3\frac{1}{2}:6\frac{2}{3}$.

9. $1\frac{2}{3}:8\frac{1}{2}$. **10.** $1\frac{3}{4}:2\frac{2}{3}$.

Review of Helpful Facts

Numbers which end with 0, 2, 4, 6, or 8 are **even** numbers.

Numbers which end with 1, 3, 5, 7, or 9 are **odd** numbers.

Each figure in a number is a **digit** of that number.

All even numbers are divisible by 2 without a remainder.

A number is divisible by 3 without a remainder if the sum of its digits is divisible by 3.

A number is divisible by 4 without a remainder if its last two digits are divisible by 4.

A number which ends with 0 or with 5 is divisible by 5 without a remainder.

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1. Mrs. James is making a new dress. The dress is to be 45 inches long with sleeves 24 inches long. Mrs. James has been told that she should buy material that is twice the length of the dress plus the length of one sleeve. How many yards of goods should she buy?

2. $3696 \div 46.2 = ?$

3. \$8.00 is 50% of what number?

4. How many rods are there in 79 yards?

5. Jane Burton earns \$4.89 per week. How much can Jane earn in a year at that rate?

6. How many $7\frac{1}{2}$-inch lengths can you cut from a piece of ribbon that is $11\frac{1}{2}$ yards long?

If a number is even and if the sum of its digits is 3, it is divisible by 6 without a remainder.

A number is divisible by 9 without a remainder if the sum of its digits is divisible by 9.

A number is divisible by 10 without a remainder if it ends in zero.

A number is divisible by 25 without a remainder if it ends with 25, 50, 75, or two zeros.

A number is divisible by 100 without a remainder if it ends with two zeros.

Subtract the following:

1	2	3	4	5
7.456	.857	902.89	77.9	36.4
1.567	.658	113.00	57.0	27.9

6. James Branom is selling books for his father. James is to have all the money that he gets from his sales. With the money he is planning to buy a velocipede that costs $13.75. How many books must he sell before he can pay for his velocipede?

7. How many gallons are there in 63.792 quarts?

8. The following recipe for bread-and-apple pudding serves 6 people:

2 cups soft bread crumbs
4 cups cooking apples cut up in pieces
$1\frac{1}{2}$ cups sugar
$\frac{1}{4}$ teaspoon salt
2 tablespoonfuls butter

How much of each ingredient would you use to make enough pudding to serve 8 people?

Changing Ratios to Their Simplest Forms When the Numbers Are Large

Example. Change 540 : 576 to its simplest form.

$$\begin{array}{r} 9)\,540:576 \\ \hline 4)\,60:\ 64 \\ \hline 15:\ 16 \end{array}$$

That is, $540 : 576 = 15 : 16$.

15 : 16 is the simplest form of 540 : 576.

The sum of the digits in 540 is divisible by 9.
This is true also of the sum of the digits in 576.
So we divided both these numbers by 9 and got 60 : 64.
Then we divided both 60 and 64 by 4 and got 15 : 16.

Find the sums:

1	2	3	4	5
27.72	121.0	3.210	.5710	4.313
44.09	720.5	4.797	.1386	1.658
98.60	148.4	9.802	.1704	8.432
24.79	679.7	5.129	.8945	8.921
56.00	788.4	1.329	.4037	7.866
61.86	110.8	5.873	.9793	1.101
21.77	486.1	3.861	.3087	.092
31.04	610.9	2.146	.0013	.097

6. 565 miles − 171 miles = ?

7. A field contains 24.8 acres. How many square rods is that?

8. Mr. Fish has all his money invested at 6 per cent. Last year his income from his investments was $135. How much money has he invested?

Change each of these ratios to its simplest form:

	(1)	(2)
(*A*)	1080 : 1728	96 : 144
(*B*)	2000 : 1750	\$3.00 : \$1.75
(*C*)	5280 : 1650	600 : 800
(*D*)	1250 : 1375	1440 : 2160
(*E*)	22500 : 17500	625 : 1000

Problems about Ratio

Each of the following sentences has a ratio in it. State each ratio in its simplest form. Rewrite each sentence, using the simplest form of the ratio. The first sentence is rewritten for you.

1. A question received 75 votes for it and 50 votes against it. (The question carried in the ratio 3 : 2.)

2. In a village election 250 votes were cast for a new schoolhouse and 450 votes were cast against it.

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1. The enrollment at Sunday school is 412. Last Sunday 114 children were absent. Find the per cent of attendance.

2. A dealer bought 78 large boxes of lead pencils. Each large box contained 6 smaller boxes, and each small box contained 12 pencils. He sold all the pencils at two for 5 cents. How much did the pencils bring?

3. A gallon of water occupies 231 cubic inches. How many gallons will it take to fill a tank which is $6\frac{1}{2}$ feet long, 5 feet wide, and $3\frac{1}{6}$ feet deep?

4. Mr. Kane drove 26.4 miles in one hour. What was his average rate in miles per minute?

5. How many quarts are there in .7 gallon?

3. A baseball team has won 35 games and lost 25.

4. A large quantity of concrete contains $\frac{1}{2}$ ton of sand, $1\frac{1}{2}$ tons of gravel, and $\frac{1}{4}$ ton of cement.

5. The enrollment of a school shows 324 girls and 288 boys.

6. A city gives \$4800 a year to the Anti-Tuberculosis Society and \$7500 a year to the Boy Scouts.

7. A rich man gave \$900 to the Children's Home and \$750 to the Red Cross.

8. A girl spends \$540.00 a year for food and \$240.00 a year for room rent.

9. A family spends \$1080 a year for food and \$510.00 a year for clothing.

10. A family spends \$150 a year for fuel and \$210 a year for health.

Find the differences:

	(1)	(2)	(3)	(4)	(5)
(*A*)	98.1	109.0	.612	6.10	81.5
	40.3	40.8	.246	1.37	22.8
(*B*)	.135	5.36	94.3	9.02	.964
	.068	1.78	24.6	8.59	.709

1. How many quarts are there in 12 bushels?

2. How many minutes are there in 2.4 hours?

3. Mr. Brown bought a piano for \$545 and sold it for 32 per cent more than it cost. How much did Mr. Brown get for the piano?

4. How many feet are there in 3.2 yards?

Denominate Numbers

Problems in the Addition of Denominate Numbers

Problem. Mrs. Ames went to a remnant sale. She bought six odd pieces of dress goods at 40 cents a yard. The lengths were as follows:

Piece	Yards	Inches
No. 1	1	18
No. 2	4	8
No. 3		34
No. 4	2	33
No. 5	3	16
No. 6	5	27
Total	18	28

How many yards of dress goods did she buy in all and how much did she have to pay?

We first add up the Inches column. The sum is 136 inches. We might write this down as the sum of the Inches column, but it is customary to think of this as yards and inches. Since there are 36 inches in one yard,

1. $36.855 \div .9 = ?$
2. 604.8 is how many times 72?
3. How many square yards are there in 26.79 square rods?
4. $9.87 \times 4.9 = ?$
5. 2321 lb. + 410 lb. + 1835 lb. + 132 lb. = ?
6. How many feet are there in .2 mile?
7. What part of a pound is 8 ounces?
8. How many ounces are there in 19.6 pounds?

136 inches will equal 3 yards and 28 inches. We write the 28 inches at the foot of the Inches column and add the 3 yards to the Yards column. This gives 18 yards and 28 inches as the number of yards bought in all. 18 yd. 28 in. $= 18\frac{7}{9}$ yd. $18\frac{7}{9}$ yd. at 40¢ a yard = \$7.52, the amount Mrs. Ames had to pay.

Solve the following problems in the same way. Be sure to change your answer to its simplest form. Make the left-hand column as large as you can and make the right-hand column as small as you can.

1. Robert Morris bought odd pieces of lumber all 6 inches wide and 1 inch thick, with the following lengths:

Piece	Feet	Inches
No. 1	10	8
No. 2	6	10
No. 3	4	9
No. 4	7	4
No. 5	11	2
No. 6	5	6

What is the total length of the lumber Robert bought?

2. Four boys, James, Tom, Frank, and Sam, wanted to club together and buy a baseball bat, ball, and catcher's glove. The total cost of these items was \$3.00 at the store, and the boys had no money. In order to get the money they planned to go into the woods and pick wild berries, which they could sell at 20 cents a quart. At the end of an hour James had picked 2 quarts and 1 pint, Tom had picked 3 quarts and 1 pint, Frank had picked 4 quarts, and Sam had picked 3 quarts. James thought that they

had enough berries to sell so that they would get money enough for what they wanted to buy. Had they berries enough? Prove your answer.

3. Arthur Loomis needs 42 running feet of 4-inch boards to make boxes for hens' nests. He can buy some 4-inch boards in odd lengths as follows:

Board	Feet	Inches
No. 1	10	8
No. 2	13	5
No. 3	6	9
No. 4	9	4

Will this lumber be enough? Prove your answer.

4. Mary Nelson plans to spend her time from 1 to 6 next Saturday afternoon as follows:

	Hour	Minutes
Practicing her music		45
Playing	1	30
Going on errands		45
Sewing	1	15
Reading stories		45
Studying	1	15

Will Mary's plan work? Prove your answer.

5. Make a plan for Mary that will work.

6. James Carter has a paper route. He went out to collect yesterday. When he returned home he found that he had 37 nickels, 28 dimes, 19 quarters, 11 half-dollars, and 7 dollar bills. How much is that in dollars and cents? James had 5 dollars with him in change when he started. How many dollars and cents did he collect?

7. At our school entertainment we took in 1 ten-dollar bill, 3 five-dollar bills, 15 dollar bills, 26 half-dollars, 39 quarters, 47 dimes, and 68 nickels. How many dollars and cents did we take in at our school entertainment?

8. The committee on relief of the poor plan to gather potatoes in the fall and store them until cold weather, when they will be given to the poor. During the potato harvest several farmers offered to give potatoes to the committee if they would come after them. The potatoes were in piles of different sizes when the men came for them. They got

5 bu. 3 pk. in the first pile,
2 bu. 2 pk. in the second pile,
6 bu. 1 pk. in the third pile,
10 bu. in the fourth pile,
7 bu. 3 pk. in the fifth pile,
4 bu. 3 pk. in the sixth pile.

How many bushels did they get in all?

9. Elsie Barton takes care of a baby in her neighborhood part of the time on week days. She gets 25 cents an hour for her work. This is her record for last week:

Days	Hours	Minutes
Monday	3	30
Tuesday	2	30
Wednesday	1	45
Thursday	2	15
Friday	3	45
Saturday		45

How much money did Elsie make last week?

Find the products:

1	2	3	4	5
17.86	567.83	7.962	.7695	35.4
30.6	.78	579	.0087	7.8

6. Mrs. McArthur bought 6 chickens for $7.00. Ten weeks later she sold all of them for $19.60. How much did her chickens increase in value per week? What was the average increase per chicken?

7. The list price for a couch was $289.25. The amount of discount was $66.00. What per cent of the list price is the net price?

8. Mary Wharton and her mother took a trip to Chicago and return on the railroad. The distance from Mary's home to Chicago is 67 miles. Full fare is 3.6 cents per mile. Mary went and returned for half fare and her mother paid full fare both ways. What was the total cost of their railroad fare for the round trip?

Problems in the Subtraction of Denominate Numbers

Problem (*A*). Robert Allen made a box for a hen's nest. He used a plank 16 feet long and 4 inches wide. When the box was finished he still had 5 feet 4 inches of his plank left. How many feet and inches of the board had Robert used in making the box?

He had used the difference between 16 feet and 5 feet 4 inches. Hence we must subtract 5 feet 4 inches from 16 feet.

Feet	Inches
16	
5	4
10	8

Find the totals:

1	2	3	4	5
430.1	39.84	9.922	.5641	9.812
799.9	77.20	4.397	.9688	3.757
205.8	62.57	1.877	.1457	7.485
760.1	10.67	3.733	.9068	5.988
445.5	45.35	3.156	.6303	1.081
876.4	64.52	1.300	.5010	8.229
435.2	40.68	3.119	.1242	2.430

6. Our lilac bush is 12.3 feet high. Our rose bush is 2.75 feet high. Our lilac bush is how many times as tall as our rose bush?

7. The list price was $9.75. The discount was 20%. What was the net price?

8. Mr. Barnes had $146.45 in the bank. He now has $88.87. What per cent of his money has he drawn out?

9. How much will 9 electric irons weigh if one iron weighs 5.4 pounds?

We cannot subtract the 4 inches from no inches, so we give 1 foot, or 12 inches, to the top number. 4 inches from 12 inches leaves 8 inches. But we must also give 1 foot to the lower number. This makes 6 feet instead of 5 feet to subtract from 16 feet. 6 feet from 16 feet leaves 10 feet. That is, Robert had used 10 feet 8 inches of his plank for the box.

Problem (*B*). Baby Frances weighed 7 pounds 10 ounces when she was born. When she was two months old she weighed 10 pounds 7 ounces. How much had Baby Frances gained in weight?

$$\begin{array}{r} 10 \text{ lb. } 7 \text{ oz.} \\ 7 \text{ lb. } 10 \text{ oz.} \\ \hline 2 \text{ lb. } 13 \text{ oz.} \end{array}$$

We cannot take 10 ounces from 7 ounces, so we give 1 pound, or 16 ounces, to the upper number. 7 ounces and 16 ounces are 23 ounces. 10 ounces from 23 ounces leaves 13 ounces. But we must also give 1 pound to the lower number, which makes it 8 pounds instead of 7 pounds. 8 pounds from 10 pounds leaves 2 pounds. That is, Baby Frances has gained 2 pounds 13 ounces.

Solve the following problems:

1. The average gain for babies is 2 pounds $8\frac{2}{3}$ ounces for the first two months. Did Frances in Problem (*B*) gain more than the average? How much more?

2. John Anderson can run and jump 7 feet 8 inches. Clarence Eden can jump 8 feet 3 inches. Which boy can jump farther? How much farther?

3. John and Clarence both go to the Emerson School. The record for the school on this jump is 9 feet 2 inches. How much does each boy lack of equaling the record?

4. In 1923 Hubbard of Michigan ran and jumped 25 feet $3\frac{1}{2}$ inches. How much does John lack of equaling Hubbard's record? How much does Clarence lack?

5. Fred Stone can jump 4 feet 8 inches high. Russell of Chicago set the record for the high jump at 6 feet 6 inches. How much does Fred lack of equaling Russell's record?

6. Mr. Rogers had a roll of ribbon with 10 yards on it on Monday morning. During the day he sold 1 yd. 18 in. to Mrs. A; 2 yd. 9 in. to Mrs. B; 27 in. to Mrs. C; and 3 yd. 24 in. to Mrs. D. How many yards of ribbon were left on the spool Monday night?

7. Mr. Clark had 20 bushels of potatoes the first of last week. During the week he sold the following amounts:

Monday	4 bu.	3 pk.
Tuesday	1 bu.	1 pk.
Wednesday		3 pk.
Thursday	3 bu.	2 pk.
Friday	2 bu.	3 pk.
Saturday	5 bu.	2 pk.

How many potatoes did Mr. Clark have left at the end of the week?

8. Grace Barber has promised her music teacher that she will practice two hours a day. Today she practiced 45 minutes in the morning and 30 minutes in the afternoon. How long must she practice after supper if she intends to keep her promise?

9. Martha Lewis can learn her lessons in 1 hour and 15 minutes. John Lewis can learn his lessons in 50 minutes. Which child learns quicker? How much quicker?

10. The state is going to rebuild 10 miles of our road this summer. They have already paved 7 miles 1320 yards. How much more of the road remains to be paved?

11. Mr. Conner wishes to purchase fencing for a field that is 40 rods square. He wishes to leave three openings for gates each 11 feet wide. How much fencing will Mr. Conner have to buy?

How to Find the Difference between Dates

When you wish to find the exact age of a person it is necessary to subtract dates. In order to do this it will be necessary for you to learn the following facts if you do not already know them.

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1. What is the area of a rectangle $2\frac{5}{12}$ feet wide and $12\frac{1}{4}$ feet long?

2. What is $4\frac{1}{4}\%$ of \$500?

3. Julia Carson can swim the length of the swimming pool in $16\frac{3}{5}$ seconds. Betty Roberts swims the same distance in $19\frac{1}{5}$ seconds. Which girl has the better record? How much better?

4. How many pounds of coffee can you buy for \$10.08 at the rate of 2 pounds for 84 cents?

5. \$3.50 per 100 pounds means how much per pound?

6. Which is greater $342 - 200$ or $342 - 298$? How much greater?

In subtracting dates count January as 1, February as 2, March as 3, April as 4, May as 5, June as 6, July as 7, August as 8, September as 9, October as 10, November as 11, and December as 12.

Problem. John Aker was born on May 13, 1905. How old was he on March 1, 1927?

We count May as 5 and March as 3. Then we write the first date in the form 1905 – 5 – 13 and the second as 1927 – 3 – 1. We write the second date over the first one and subtract.

1927	3	1
1905	5	13
21	9	18

We cannot take 13 days from 1 day; so we give the upper number another month or 30 days. 30 days and 1 day are 31 days. 13 days from 31 days leaves 18 days. Then we must give another month to the lower number also. This makes the 5 a 6. We cannot subtract 6 months from 3 months so we give a year, or 12 months, to the upper number. 12 months and 3 months are 15 months. 6 months from 15 months leaves 9 months. We must not forget to give another year to the lower number, making 1906 instead of 1905. 1906 from 1927 leaves 21 years. That is, John was 21 years 9 months 18 days old on March 1, 1927.

In the list which follows, the dates in the column on the left tell when each person was born. The dates in the column on the right are to be used in finding the age of each person.

Find the exact ages:

Person	Date of Birth	Date for which Age Is to Be Found
A	July 18, 1839	March 12, 1928
B	December 15, 1893	February 3, 1927
C	August 6, 1903	January 24, 1927
D	November 9, 1921	September 20, 1927
E	October 25, 1883	April 4, 1926
F	June 8, 1921	May 23, 1924
G	March 27, 1900	December 15, 1922
H	January 6, 1918	November 3, 1925
I	May 21, 1910	October 10, 1922
J	February 19, 1911	September 11, 1924
K	April 16, 1909	August 14, 1921
L	June 13, 1914	July 7, 1925

How to Find the Exact Number of Days between Dates

Learn this rime:

Thirty days hath September,
April, June, and November.
All the rest have thirty-one
Except the second month alone.
To it 28 we assign,
Till leap year gives it 29.

Count a year as 360 days. This is the way to tell whether or not a year is a leap year. All leap years are divisible by 4 unless the number of the year ends with two zeros. In that case if the year is a leap year, the number of the year must be divisible by 400. This is the reason why the year 1900 was not a leap year.

Problem. A bank discounted a note, dated December 15, 1920, on January 20, 1921. The note was to run 90 days from December 15. How many days had the note to run after it was discounted?

The first thing to do is to find when the note is due. There are 31 days in December and the note was dated December 15. 15 days from 31 days leave 16 days, which the note ran in December. January has 31 days. 16 days and 31 days are 47 days, the time the note ran by the end of January. The year 1921 was not a leap year because 1921 is not divisible by 4. Hence February, 1921, had only 28 days. 47 days and 28 days are 75 days. March has 31 days. 75 days and 31 days are 106 days. But the note was to run only 90 days. 106 days are 16 days too many. Therefore the note will fall due 16 days before the end of March, or on March 15.

The bank wants to know how long the note will run after January 20. That is, it wants to know how many

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Find the differences:

1	2	3	4	5
4.863	115.2	1.934	62.31	.0783
1.998	50.4	.960	9.93	.0545

6. Find the total cost of the following purchases:

$\frac{1}{2}$ dozen linen napkins at $4.50 per dozen
$\frac{1}{2}$ dozen plates at 90 cents each
$\frac{1}{2}$ dozen cups and saucers at 50 cents for each cup and saucer
1 pair pillow cases at 75 cents per pair
2 sheets at $1.25 each.

days there are from January 20 to March 15. There are 11 days left in January, 28 days in February, and 15 days in March, or 54 days in all.

The date when a note is due is called the **date of maturity.**

Find the dates of maturity and the number of days which each of the following notes run after being discounted:

1. A 90-day note dated November 7 and discounted December 20.

2. A 30-day note dated February 4, and discounted on February 18.

3. A 45-day note dated May 15 and discounted on June 10.

4. A 15-day note dated March 20 and discounted March 25.

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1. The girls of the sixth grade had a candy sale. Mae gave $2\frac{1}{2}$ pounds, Elizabeth gave 2 pounds and 3 ounces, Mary $2\frac{3}{4}$ pounds, Jane 25 ounces, Faye $1\frac{7}{8}$ pounds, June $1\frac{3}{8}$ pounds, and Harriet $3\frac{1}{4}$ pounds. They sold all their candy at 50 cents a pound. How much money did they receive for all the candy?

2. Our basketball team won all but $8\frac{1}{3}\%$ of their games this year. What per cent of their games did they fail to win?

3. What is the cost of 24 pairs of shoes at $7.98 per pair?

4. One of Mrs. Grundy's cakes will serve 24 persons. How many persons will 20 of her cakes serve?

5. What part of one of her cakes will it take to serve 20 persons?

5. A 60-day note dated June 23 and discounted July 16.

6. A 90-day note dated November 18 and discounted January 2.

7. A 10-day note dated August 28 and discounted September 1.

8. A 30-day note dated March 13 and discounted April 2.

9. A 45-day note dated October 25 and discounted November 20.

10. A 60-day note dated December 3 and discounted January 1.

11. School started on September 4 and is to run 36 weeks with two weeks vacation at Christmas. Counting a week as 7 days, when will school be out?

12. How many days are there from November 13 to Christmas?

Find the quotients:

	(1)	(2)	(3)	(4)
(A)	$.8\overline{)4.25}$	$7\overline{)20.002}$	$.006\overline{)2.0318}$	$.04\overline{)2.96}$
(B)	$.6\overline{).036}$	$.08\overline{)3116}$	$7\overline{).3143}$	$.5\overline{)2.65}$

1. The enrollment in Room No. 6 is 47. Yesterday 43 pupils were present. What per cent were absent?

2. How many dollars is 7% commission on $1000?

3. 76.44 is how many times 7.8?

4. How many feet are there in 54 inches?

Finding Differences in Hours and Minutes

In referring to the time of day, A.M. means before noon, P.M. means after noon. On railway time-tables time before noon is written in light type and time after noon is written in heavy type. The number of hours is separated from the number of minutes by a colon or by a wide space. Thus **5 30** means half past 5 P.M. and 8 05 means 5 minutes after 8 A.M.

Problem. The Duluth Limited train leaves Chicago at 5 30 P.M., and arrives in Duluth at 8 45 A.M. the next day. How long does it take the Duluth Limited to run from Chicago to Duluth?

We first find the time from 5 30 P.M. to midnight. Since midnight is 12 o'clock we write

Hours	Minutes
12	0
5	30
6	30

1. Mr. Roberts drove his team 50 miles yesterday. He started at 7 in the morning and drove until 12. He allowed his horses to rest until 2 P.M. and arrived at the end of his journey at 6.45. What was his average rate per hour while driving?

2. At $3\frac{3}{4}$ miles per hour how long would it take to walk 12 miles?

3. $\$134.53 - \$66.89 = ?$

4. Our grocer buys apples at $3.12 a bushel, which weighs 60 pounds, and sells them at 3 pounds for 25¢. How much more is the selling price than the cost price per bushel?

That is, we subtract 5 hours 30 minutes from 12 hours and get 6 hours and 30 minutes. Then we add the 8 hours and 45 minutes that the train runs after midnight to the 6 hours and 30 minutes that the train ran before midnight.

Hours	Minutes
6	30
8	45
15	15

The answer is 15 hours and 15 minutes.

Find the differences:

1	2	3	4	5
.679	129.11	678.1	.7472	6.216
.333	47.77	288.9	.2566	1.460

6. Find the amount of this bill:

1 rug, 27″ × 54″ $5.50
1 rug, 9′ × 12′ 85.78
1 rug, 9′ × 12′ 12.75
24 yd. curtain material at 76¢ per yard

7. How many quarts are there in 3.67 gallons?

8. John Barlow picked $9\frac{1}{2}$ pecks of apples in 2 hours. His little brother picked $2\frac{3}{4}$ pecks in the same time. How many more pecks did John pick than his brother?

9. How many feet are there in 3.6 yards?

10. What per cent of 64 is 8?

11. What does $\frac{2}{3}$ mean in per cent?

12. How many feet are there in .621 mile?

13. Mr. Warner pays $75.00 per month rent. How much is his rent for one year?

Solve the following problems:

1. Find the running time of each of the following trains:

Train	Leaves		Arrives	
1. Golden State Limited	Chicago	8 30	Kansas City	10 30
2. Golden State Limited	Tucson	3 55	El Paso	1 25
3. The Broadway Limited	New York	2 55	Pittsburgh	12 28
4. The Gotham Limited	Pittsburgh	9 25	New York	7 10
5. The Panama Limited	Chicago	12 30	New Orleans	11 15
6. The Olympian	Tacoma	8 00	Spokane	8 25
7. The Olympian	Chicago	11 00	Aberdeen	12 30
8. The Sunshine Special	St. Louis	6 45	Shreveport	10 25
9. The Lark	Los Angeles	8 00	San Francisco	9 30
10. No. 171	Boston	6 30	Washington	7 15

2. On Christmas Day in New Orleans the sun rises at 6:52 and sets at 5:06. How many hours of sunshine are there in New Orleans on Christmas Day?

3. On June 25 in New Orleans the sun rises at 5:55 and sets at 7:05. How many hours of sunshine are there in New Orleans on June 25?

4. On Christmas Day in Duluth the sun rises at 7:58 and sets at 4:02. How many hours of sunshine are there in Duluth on Christmas Day?

5. On June 25 in Duluth the sun rises at 4:47 and sets at 8:13. How many hours of sunshine are there on June 25?

1. Mr. Ames bought three loads of coal which weighed as follows:

Load 1 . . . . . 2240 lb. net
Load 2 . . . . . 1872 lb. net
Load 3 . . . . . 2800 lb. net

He paid $11.75 per ton for the coal. What was the amount of his bill?

6. How many more hours of sunshine are there on Christmas Day in New Orleans than there are in Duluth?

7. How many more hours of sunshine are there in Duluth on June 25 than there are in New Orleans?

8. School begins at 9:00 and closes at 4:00. How many hours are there from 9:00 A.M. to 4:00 P.M.?

9. One hour and 45 minutes of this time is spent in recesses and noon intermission. How many hours and minutes does the school actually run?

10. Grace has promised to practice 45 minutes each afternoon. If she begins practicing at 4:30, at what time may she stop practicing and still keep her promise?

11. James has promised his teacher that he will study 1 hour and 15 minutes tonight. He goes to bed regularly at 9:00. At what time must he start studying in order to finish by bedtime?

Find the sums:

1	2	3	4
8.893	.1211	343.2	
6.980	.9987	527.9	5485
4.298	.2069	180.0	8646
2.476	.9906	428.5	4398
6.707	.7080	577.9	1193
2.321	.1125	662.6	7907
7.114	.2876	366.3	5515
.208	.4705	501.0	900

5. 3.5 inches are what part of 28 inches?

6. 35 feet are 25% of how many feet?

12. It takes 1 hour 45 minutes to drive from home to the city. At what time must I start in order to reach the city at 10 o'clock?

13. It takes Mary 45 minutes to get supper. If supper is served at 6:30, when must Mary start to prepare it?

Multiplying with Denominate Numbers

Problem. If Grace Coleman practices 1 hour and 15 minutes each day, how many hours and minutes will she have practiced at the end of 10 days?

Hour	Minutes
1	15
	10
12	30

We first multiply the 15 minutes by 10. This gives 150 minutes. But 60 minutes make one hour, so 150 minutes are equal to 2 hours 30 minutes. We write the 30 minutes as part of the answer and carry the two hours. One hour multiplied by 10 equals 10 hours. Ten hours and 2 hours which we had to carry are equal to 12 hours. That is, at the rate of 1 hour and 15 minutes per day, Grace will have practiced 12 hours 30 minutes in ten days.

Get the answers to these problems:

1. If it requires 3 yards and 27 inches of goods to make one dress, how much goods will be needed for three such dresses?

2. How many rods of barbed wire will be needed to put three strands of wire around a lot that is 150 feet square, if no allowances are made for gaps?

3. If one can of fruit weighs 1 pound 8 ounces, what will two dozen such cans weigh?

4. The girls in our school are planning to make 150 ribbon badges. Each badge is to consist of two pieces of ribbon of different colors, one 6 inches and the other 5 inches long. How many yards of each color must the girls buy?

5. Sam and Harry are carrying water to be used at a school picnic. Sixty gallons of water will be needed in all. Each of the boys has two pails and each of the pails will hold 2 gallons and 2 quarts of water. Can they carry the sixty gallons in six trips? Prove your answer.

6. Mr. Packard's wheat crop averaged 22 bushels 3 pecks to the acre last year. Next year he plans to sow 30 acres of wheat. How many bushels of wheat will he raise if the yield for next year is just as good as it was last year?

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1. How many pints are there in 4.62 quarts?

2. Last week James Grant paid as follows for his luncheons: Monday, 45 cents; Tuesday, 56 cents; Wednesday, 75 cents; Thursday, 39 cents; Friday, 49 cents; Saturday, 61 cents; and Sunday, $1.00. What was the average cost of his luncheons per day?

3. How many inches are there in 3.6 feet?

4. Find the cost of $2\frac{1}{2}$ dozen eggs at 22 cents per dozen and $1\frac{1}{4}$ pounds of butter at 76 cents per pound.

5. The regular price for traveling bags was $18.25, but Mrs. Green found a bag just as good on sale for $13.69. What per cent of $18.25 did Mrs. Green save?

7. James Rowland needs 150 boards each 2 feet 6 inches long and 6 inches wide to use in a walk which he is making. How many feet of 6-inch lumber will he need?

8. If it takes 3 yards 27 inches of braid trimming for one dress, how much trimming will be needed for four such dresses?

9. If it requires 2 pounds 7 ounces of food per person for each day spent in camp, what will be the weight of enough food to last 15 people during a 10-day camp?

10. If each shingle has 24 square inches of its surface exposed, how many square feet will 1000 such shingles cover?

11. If 32 square inches are required for each onion planted, how many square feet of ground will be needed if 2000 onions are to be planted?

Find the quotients:

	(1)	(2)	(3)	(4)
(*A*)	$8\overline{)100.8}$	$.9\overline{)101.08}$	$.07\overline{)10.05}$	$.008\overline{)20.24}$
(*B*)	$.09\overline{)2.142}$	$.7\overline{)5.5146}$	$9\overline{).7371}$	$.06\overline{).612}$

1. Mrs. Wallace had 5 dollars. She lost 45 cents. What per cent of her money did she lose?

2. Change $\frac{7}{8}$ to a decimal.

3. How many quarts are there in 8.21 pecks?

4. Find the amount of this bill:

Moving piano	$6.50
Moving household goods	16.79

5. $1554 + 789 + 369 = ?$

Dividing with Denominate Numbers

Problem. Mrs. Smith, Mrs. Bowles, Mrs. Thorne, and Mrs. Blaine went together and bought 7 bushels 3 pecks of apples. They wish to divide the apples equally. How many apples will each lady get?

Since there are 4 ladies, we divide 7 bu. 3 pk. by 4.

$$4\overline{)7 \text{ bu. } 3 \text{ pk.}}$$
$$1 \text{ bu. } 3\tfrac{3}{4} \text{ pk.}$$

Four goes into 7 bu. once with 3 bu. over. So we carry 3 bu. to 3 pk. 3 bu. = 12 pk. 12 pk. + 3 pk. = 15 pk. 15 pk. ÷ 4 = $3\frac{3}{4}$ pk. That is, each lady will get 1 bu. $3\frac{3}{4}$ pk. of apples.

Solve these problems in a similar way:

1. Mr. King raised exactly 208 bushels 2 pecks of wheat on a field containing 15 acres. What was the average yield per acre?

2. Mrs. Vance picked 30 bushels 1 peck of tomatoes from 24 plants. What was the average yield per plant?

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1. When apples are selling at \$1.45 per bushel, how many bushels of apples can you buy for \$13.05?

2. How many pounds are there in 80 ounces?

3. Which is cheaper, to subscribe for a magazine at \$3.00 per year or to pay 35 cents per copy each month? How much cheaper?

4. How many quarts are there in 23.48 gallons?

5. How many minutes are there in 8.3 hours?

6. How many rods are there in 240 feet?

7. How many square feet are there in $8\frac{2}{3}$ square yards?

3. Mr. Markham wishes to plant 200 pear trees in an orchard which is 40 rods square. A space 16 feet square should be allowed for each pear tree. Can Mr. Markham plant his trees in this orchard without getting the trees too close together? Prove your answer.

4. The Boy Scouts are going camping. The camp is to include 45 persons. They are taking 768 pounds of food. How much is this per person?

5. If they stay in camp 7 days, how many pounds of food may each person have per day?

6. Forty-six bushels 3 pecks of potatoes are to be divided equally among 11 poor families. How many potatoes will each family receive?

Find the quotients:

	(1)	(2)	(3)
(*A*)	$6.5\overline{)5323.86}$	$.57\overline{)2035.25}$	$95\overline{)53.0127}$
(*B*)	$.043\overline{)30.9136}$	$.037\overline{)1013.815}$	$76\overline{)1133.37}$
(*C*)	$88\overline{)2001.28}$	$17\overline{)103.313}$	$18\overline{)5311.04}$

1. There were 300 boys in the inter-city field meet. Twenty-four of them took prizes. What per cent of the boys was that?

2. If one roasted chicken serves 8 persons, how many chickens will it take to serve 24 persons?

3. Multiply 8.594 by 7.9.

4. How many pints are there in 4.25 quarts?

5. Multiply $85.42 by 274.

More Problems in Dividing with Denominate Numbers

Problem. How many 6-inch badges can be cut from 10 yards of ribbon?

We need to divide 10 yards by 6 inches. But we cannot divide numbers until we make them alike. Ten yards is not like 6 inches, but we can make it like 6 inches if we change the yards to inches. 10 yards equals 360 inches. 360 inches divided by 6 inches gives 60, which is the answer.

Solve the following problems in the same way. Be sure to make the numbers alike before you divide.

1. Mr. Johnson wishes to build a fence around a field that is 40 rods long and 20 rods wide. He plans to set the posts 12 feet apart. How many posts will he need?

2. If it requires 3 yards 24 inches of cloth to make one dress, how many such dresses can be made from a piece of cloth 18 yards 12 inches long? (Change both divisor and dividend to inches.)

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1. The Troy Vocational School building was built in 1800. The Troy High School was built in 1910. Which building is older? How much older?

2. Linoleum costs $1.25 per square yard. How much will it cost to cover a floor that is $15\frac{1}{2}$ feet wide and 23.5 feet long?

Gross weight in hauling is the weight of a wagon or truck and its load.

Net weight is the weight of the load itself, and **tare** is the weight of the wagon or truck when empty.

3. The gross weight of a load of coal was 7435 pounds. The tare was 2345 pounds. What was the net weight?

3. If a sack of wheat contains 2 bushels 2 pecks, how many sacks will be needed to hold 200 bushels of wheat?

4. How many bricks will be needed to cover the floor of a cellar 8 feet by 10 feet if each brick covers 32 square inches?

5. If each shingle has 24 square inches of its surface exposed to the weather, how many shingles will be required to cover an area of roof $11\frac{1}{3}$ feet by 24 feet?

6. Fruit jars are to be packed in boxes 1 foot 4 inches wide and 2 feet long. If each jar when packed occupies 16 square inches, how many jars will each box hold?

7. How many lots containing 10250 square feet can be made from a square piece of land containing three acres?

Find the sums:

1	2	3	4	5
31.10	3.132	.4132	944.2	89.79
98.72	7.989	.9606	568.8	99.77
40.07	6.808	.5763	336.4	24.12
17.66	4.086	.7287	698.6	14.34
78.60	5.941	.1995	161.0	36.72
30.19	2.804	.8338	900.8	53.17
57.92	7.099	.0660	156.9	20.41
43.47	2.130	.0107	202.0	11.04

6. Our school lost 15% in its enrollment last year. What per cent remained?

7. Roger Clark put $100 into his savings bank. One year later the bank paid him $103. What per cent of interest did the bank pay?

Finding Areas

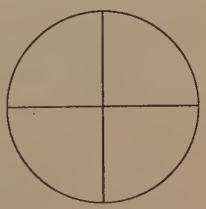
Area means amount of surface. It is measured in square inches, square feet, and the like. Review the following facts and memorize all that you do not already know.

160 sq. rd. = 1 A.	640 A. = 1 sq. mi.
144 sq. in. = 1 sq. ft.	9 sq. ft. = 1 sq. yd.
$30\frac{1}{4}$ sq. yd. = 1 sq. rd.	

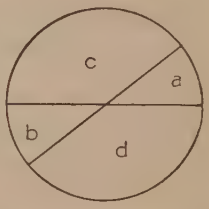
Some Things to Do

1. See if you can draw two or three lines that would never intersect no matter how long you might make them. Such lines are called **parallel lines.**

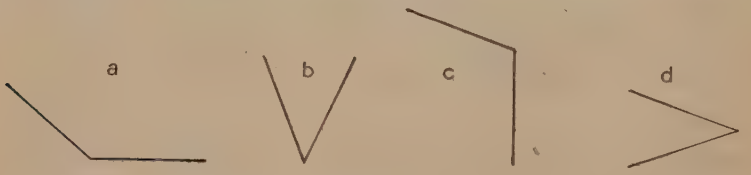
2. Tie a string to your pencil near the point. Measure exactly two inches on the string from the point of the pencil. Using the part of the string just measured, draw a circle with your pencil on your tablet. Now draw two straight lines through the center of the circle in such a manner that the circle will be divided into four equal parts, just as mother does when she cuts a pie into quarters. Any two lines drawn in this manner will be **perpendicular** to each other. When two lines meet or cross each other as these two lines do, they are said to **intersect** and form **angles** with each other. The angles formed by perpendicular lines are called **right angles.**



3. Draw another circle just like the first one. Draw two straight lines through the center of this circle which do not divide the circle into four equal parts. Notice the angles which these lines make with each other. Two of them, angle a and angle b, are less than a right angle, and the other two, angle c and angle d, are greater than a right angle. Angles which are less than right angles are called **acute angles**. Those which are greater than right angles are customarily called **obtuse angles**.



4. Tell whether the angle is acute or obtuse in each of these cases:



1. Find the area of a piece of land 9 rods long and 4 rods wide in square rods. How many square yards are there in this piece of land?

2. Mary Grimes bought this material for her new dress:

$2\frac{3}{4}$ yd. of twill at $3.35 per yard
2 dozen buttons at 3 for 5 cents
1 spool silk thread at 10 cents

What was the amount of her bill?

3. What is the product of 6872 and .0375?

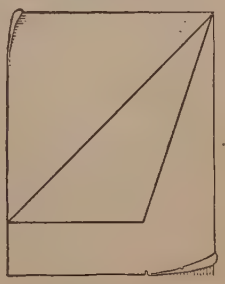
4. How much is $\frac{3}{7}$ of 50.4?

5. What part of a yard are 30 inches?

5. Draw two acute angles.

6. Draw two obtuse angles.

7. Take a sheet of paper from your tablet. With your pencil and ruler draw a line from the left-hand edge of the sheet parallel to the bottom of the sheet and extending about halfway across the sheet. Now draw lines from each end of this line to the upper right-hand corner of the sheet.



You have drawn what is called a **triangle.** How many angles has your triangle? How many sides? How many acute angles? Has it a right angle?

8. Draw a square on your tablet. A square must have four equal sides and four right angles. The opposite sides of a square are parallel.

Find the differences:

1	2	3	4	5
.6192	9.32	9.431	797.3	8.872
.2568	2.56	1.542	307.7	3.009

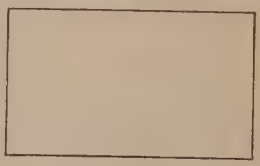
6. What is $4\frac{3}{4}\%$ of \$6000?

7. Find the amount of the bill for the following purchases:

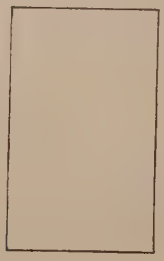
2 school dresses at \$18.64 each
1 pair galoshes, \$3.53
1 raincoat, \$14.85
1 pair winter gloves, \$1.98

8. What will 24 dozen oranges bring when sold at the rate of 4 for 15 cents?

9. See if you can draw another kind of figure or picture that has four right angles. Make the opposite sides parallel and equal, but make one pair of parallel sides longer than the other, like this:



or this:



Such figures are called **rectangles.** Every figure of four sides which has its opposite sides parallel is called a **parallelogram.** Fig. a and Fig. b are parallelograms:

Fig. a

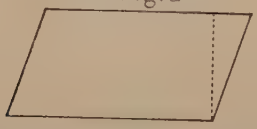


Fig. b

Is a square a parallelogram? Is a rectangle a parallelogram?

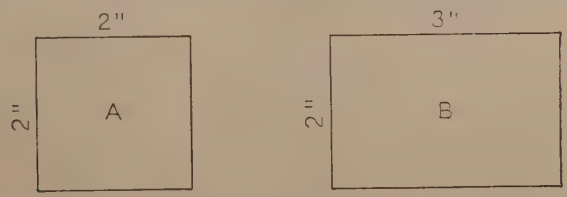
10. See if you can draw a parallelogram which has no right angles in it.

If the opposite sides of this sort of parallelogram are equal, the figure is called a **rhombus.** Fig. b is a rhombus. Sometimes we call one side of a parallelogram the base of the parallelogram. The perpendicular line drawn

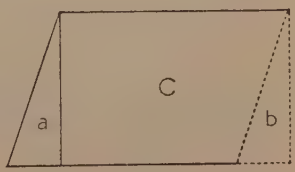
from the base of the parallelogram to the opposite side is called the **altitude** of the parallelogram. Often the lower line of the parallelogram is called the base, but this is not always the case.

To find the area of any parallelogram, you **multiply the base by the altitude.** Be sure that both base and altitude are in the same units before you multiply.

This is easy to see in the case of a square or a rectangle because it is the same as multiplying the length and the

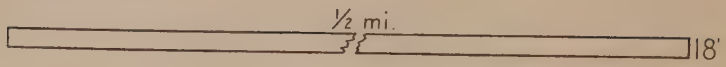


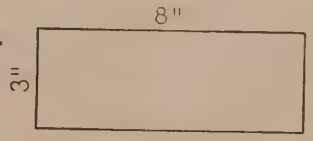
width. Thus the area of square A is four square inches, and the area of rectangle B is 6 square inches. But the rule holds good for parallelogram C also, because the triangle marked "a" can be taken away and placed in the position of triangle b. This changes the parallelogram into a rectangle of the same size as rectangle B. The rectangle has the same altitude, and its base is equal in length to the base of the parallelogram.

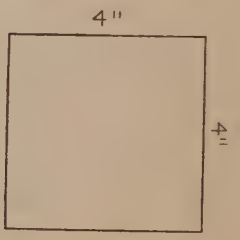


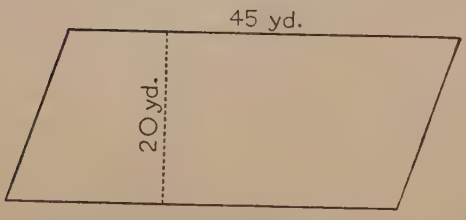
11. With your scissors cut out a parallelogram shaped like parallelogram C. Now cut off the triangle a and place it where triangle b is. Did you get a rectangle? Lay the two pieces upon rectangle B. Can you make them fit?

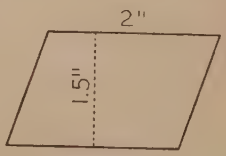
Find the areas:

1. 

2. 

3. 

4. 

5. 

6. How many square feet are there on each side of a board which is 16 feet long and 4 inches wide?

7. How many square yards are there in a garden which is 50 feet wide and 60 feet long?

---

1. Coal is often carried in baskets when it is unloaded. If a basket contains 58 pounds of coal, how many basketfuls will there be in a load of coal which weighs $1\frac{1}{2}$ tons?

2. The list price of an article is \$6.53. The discount is 9%. What is the net price?

3. Mr. James has just sold 840 dollars' worth of goods. His commission is 7%. What is the amount of his commission?

4. Edward Bowden rode his bicycle 63.25 miles in $8\frac{1}{2}$ hours of riding time. What was his average rate per hour while riding?

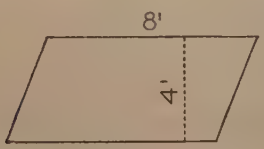
8. How many square yards are there in a sidewalk 4 feet wide and 1500 feet long?

9. John Mason is building a walk out of boards. He is laying the boards crosswise. The boards are 6 inches wide. How many boards will he need for a walk that is to be 75 feet long?

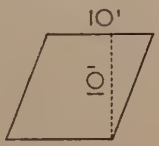
10. A spool of barbed wire contains 1320 feet of wire. How many such spools will be required to place three strands of wire about a field which is 80 rods square?

Find the area of each of these parallelograms:

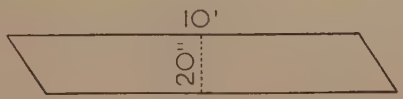
1.



2.



3.



1. If a bricklayer can lay 7 bricks per minute, how many hours and minutes of working time will it take him to lay 3122 bricks?

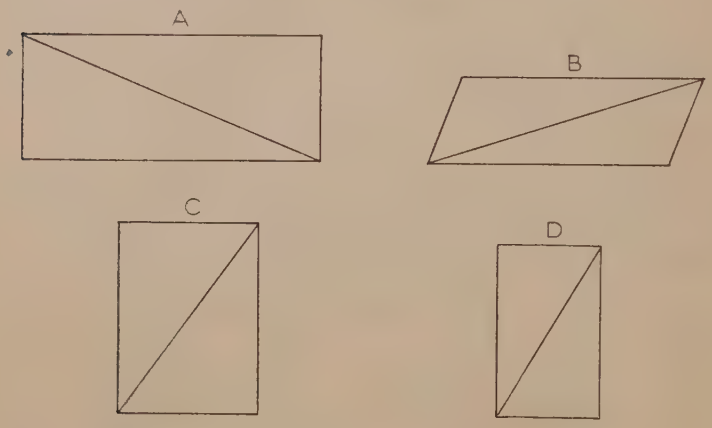
2. A grocer buys potatoes at $1.65 per bushel and sells them at $2.25 per bushel. What per cent of the selling price is his margin?

3. A telegraph lineman averages $4\frac{3}{4}$ miles per hour when inspecting his line. At that rate how many working hours will it take him to inspect 115 miles of line?

4. How many pints are there in 4.36 quarts?

Finding the Areas of Triangles

Look at these figures:



Each of them is a parallelogram, and each of them has a line drawn through it that divides the parallelogram into two equal triangles. The line which divides a parallelogram into two equal triangles is called a **diagonal**. Now

---

Find the differences:

1	2	3	4	5
.9632	1.412	19.42	134.5	.1766
.3934	.723	9.64	99.9	.0990

6. What will 89 chickens weigh if the average weight of the chickens is 6.4 pounds?

7. Robert Gaines had saved $48.08. He bought a toy automobile for $27.75. What per cent of $48.08 did he have left?

8. How many minutes will it take a horse to go 5 miles at the rate of 8.5 miles per hour?

the area of each parallelogram is equal to its base multiplied by its altitude. Each triangle is equal to one half of the corresponding parallelogram and has the same base and altitude as the parallelogram. Therefore, the area of a triangle equals one half of its base multiplied by its altitude. To find the area of a triangle **multiply its base by its altitude and take one half the product.**

Find the area of each of the following triangles:

Triangle	Base	Altitude
A	3.5 ft.	1.5 ft.
B	5 mi.	1.25 mi.
C	75 rd.	20 rd.
D	8 in.	4.5 in.
E	250 ft.	150 ft.
F	27 yd.	14 yd.
G	16.5 rd.	20 rd.
H	60 yd.	90 ft.
I	2 ft.	8 in.
J	1 mi.	160 rd.

Find the quotients:

	(1)	(2)	(3)
(*A*)	$9.2\overline{)411.246}$	$.28\overline{)4210.16}$	$3.6\overline{)20.2203}$
(*B*)	$.068\overline{)12.2124}$	$.75\overline{)6145.09}$	$5.4\overline{)404.535}$
(*C*)	$.48\overline{)20.1044}$	$.025\overline{).3298}$	$.055\overline{)1.015}$
(*D*)	$9.24\overline{)40756}$	$942\overline{)2336.16}$	$.82\overline{)92.315}$
(*E*)	$6.51\overline{)721804}$	$92.1\overline{)277.776}$	$.524\overline{)44.1208}$
(*F*)	$4.72\overline{)896.448}$	$327\overline{)6934.56}$	$.675\overline{)865.785}$

Practice Exercises

Find the sums:

1	2	3	4
.4943	7.444	.7898	2.39
.2948	6.830	.8567	105.83
.3534	6.709	.5647	96.58
.6908	3.088	.7265	9.75
.2160	3.896	.3584	78.92
.3609	4.111	.0328	56.85
.8083	2.226	.0510	29.76
.0061	2.624	.0140	.87

5. What is the difference between $30 - 17$ and $30 - 15$?

6. Nine is 15% of what number?

7. How many quarts are there in $3\frac{1}{4}$ gallons?

8. 4574207 is how many times 323?

9. Find the total of this bill:

1 chicken, 6 lb., at 30¢ per pound
2 lb. cranberries at $12\frac{1}{2}$¢ per pound
$2\frac{1}{2}$ lb. butter at 58¢ per pound
1 loaf bread at 9¢
2 qt. milk at $12\frac{1}{2}$¢ per quart
$\frac{1}{2}$ pt. cream at 30¢ per pint

10. Mr. Ayres bought $2\frac{3}{4}$ tons of coal at $9.85 per ton. He paid with a check for $65.12. How much change did he receive?

11. On December 12, Jane Black was 15 years old. Marian Black is 2 years 10 months younger than Jane. How old was Marian on December 12?

12. Nine is what per cent of 45?

13. How many feet are there in $2\frac{1}{6}$ yards?

How Figures Are Lettered

When you are writing about figures, you often need to indicate just which figure or part of a figure you wish to consider. In order to do this, you will need to remember a few things.

The smallest possible portion of a line is called a **point.**

A point is usually marked or designated by a dot with a letter close by it. Thus point P is known as P.

A larger part of a line is designated by two letters, as

These lines are called line AB and line CD, respectively.

Parallelograms, squares, rectangles, and triangles are designated by placing a letter at each corner.

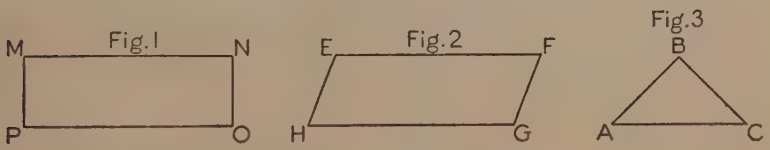


Fig. 1 is spoken of as rectangle MNOP.

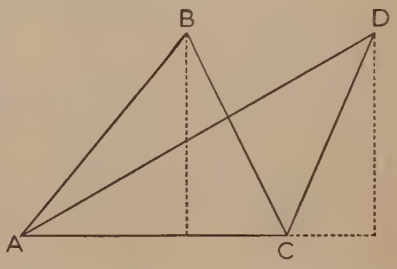
Fig. 2 is called parallelogram EFGH.

Fig. 3 is triangle ABC.

How to Draw Triangles

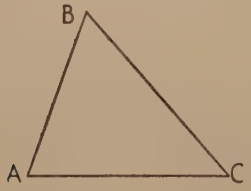
Problem. Draw a triangle with a base of $1\frac{3}{8}$ inches and an altitude of $1\frac{1}{16}$ inches. Line AC is $1\frac{3}{8}$ inches long; so it will do for the base of the triangle. The other corner of the triangle must be $1\frac{1}{16}$ inches from line AC, and the $1\frac{1}{16}$ inches must be measured along a line which is perpen-

dicular to AC *or* AC *extended* in either direction. Any number of triangles of this sort can be drawn above or below AC. Triangles ABC and ADC are two that may be drawn above AC. Each has a base $1\frac{3}{8}$ inches long and an altitude $1\frac{1}{16}$ inches long. Sometimes the altitude line meets the base, and sometimes it is necessary to extend the base as in the case of triangle ADC. Each of these triangles has the same base and altitude, and they are therefore equal in area.

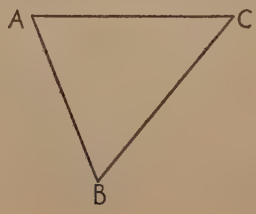


Draw six more triangles each with a base $1\frac{3}{8}$ inches long and an altitude $1\frac{1}{16}$ inches long.

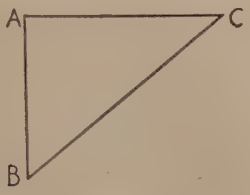
1. Make one triangle that will look like this:



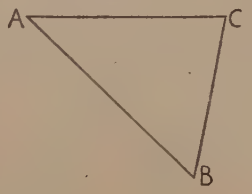
2. Make one that will look like this:



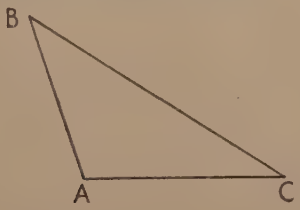
3. Make one that will look like this:



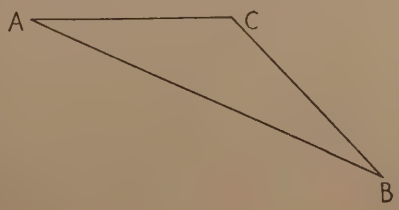
4. Make one that will look like this:



5. Make one that will look like this:



6. Make one that will look like this:



Measuring Odd-Shaped Figures

Any odd-shaped area can be divided into triangles. Then we can find the area of each triangle and add the results. The figures on this page have been divided into triangles. Measure the base and the altitude of each triangle with your ruler and get the area of each figure.

Fig. 1

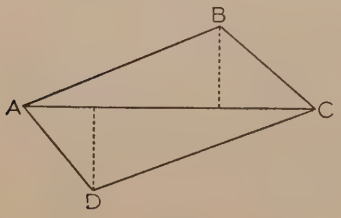


Fig. 2

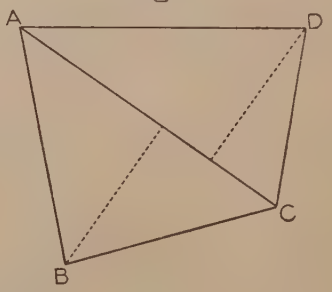


Fig. 3

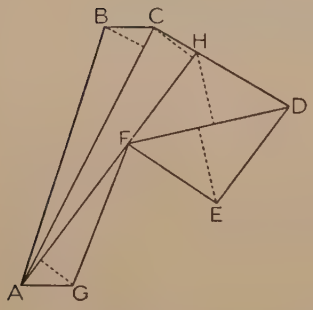


Fig. 4

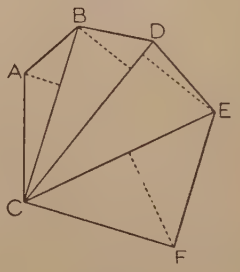


Fig. 5

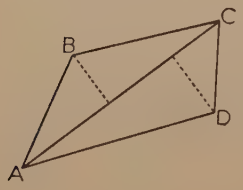
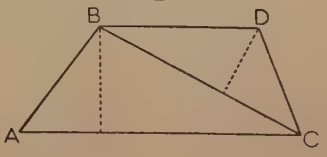


Fig. 6



Measuring Lumber

Lumber is measured in **board feet.** A board foot has a surface which contains 144 square inches, or 1 square foot, and a thickness of 1 inch. In buying and selling lumber a thickness less than 1 inch is counted as 1 inch. Boards that are more than 1 inch thick but not more than 2 inches thick are counted as 2 inches thick. In the following examples ′ means feet and ″ means inches, and × means **by.** A piece of lumber 2″ thick and 4″ wide is often called a two-by-four. In like manner a piece 4″ thick and 6″ wide is called a four-by-six, and so on.

Write the numbers from 1 to 10 on your tablet. Now look at example 1. If it contains one board foot, write "Yes" after the 1 on your tablet. If it contains more or less than a board foot, write "No" after 1 on your tablet. Do the same with the other examples.

1. A piece of lumber $9'' \times 16'' \times \frac{1}{2}''$.
2. A piece of lumber $12'' \times 12'' \times 2''$.
3. A piece of lumber $2' \times 6'' \times 1''$.
4. A piece of lumber $15'' \times 10'' \times 1''$.
5. A piece of lumber $6' \times 2'' \times \frac{3}{4}''$.
6. A piece of lumber $14'' \times 11'' \times 1''$.
7. A piece of lumber $12' \times 1'' \times 1''$.
8. A piece of lumber $3' \times 4'' \times 1\frac{1}{2}''$.
9. A piece of lumber $4' \times 3'' \times \frac{3}{4}''$.
10. A piece of lumber $18'' \times 8'' \times \frac{1}{4}''$.

Find the number of board feet in each of the following:

1. One 4×6, 12 ft. long.
2. Ten 2×4's, each 16 ft. long.
3. One hundred 1×6's, each 14 ft. long.
4. Twenty-five 1×4's, each 12 ft. long.
5. Thirty 2×8's, each 10 ft. long.
6. Twelve 6×8's, each 14 ft. long.
7. Fifty-six pieces of lumber, each $16' \times 3'' \times \frac{3}{4}''$.
8. Forty-eight pieces of lumber, each $14' \times 4'' \times \frac{1}{2}''$.
9. Fifteen 2×6's, each 12 ft. long.
10. Nine 1×10's, each 14 ft. long.

---

1. The employees of the Hill and Company Dry Goods Store receive 10% discount on all the goods that they buy for themselves. How much would a clerk have to pay for these goods:

$2\frac{1}{4}$ yd. elastic at $12\frac{1}{2}¢$ a yard
3 yd. crêpe at $27¢$ a yard
$1\frac{1}{6}$ yd. flannel at \$1.59 per yard

2. The enrollment of the Rockingham High School is 169. Tuesday only 155 were present. What per cent of the pupils were absent?

3. What per cent is $\frac{2}{7}$?

4. How many inches are there in $2\frac{5}{6}$ feet?

5. Change $\frac{6}{7}$ to a decimal.

6. A dealer paid \$666.88 for 521 Christmas toys. What was the average cost of each toy?

Finding the Areas of Circles

The curved line which is the edge of a circle is called a **circumference.** Every point on the circumference is equally distant from the center of the circle. Any line drawn from the circumference to the center of a circle is a **radius** of the circle. The **diameter** is the distance across a circle measured along a straight line that passes through the center. The diameter equals two times the radius. **The circumference of a circle equals 3.1416 times the diameter. The area of a circle is equal to half the circumference times the radius.**

(*A*) *Making use of these facts, find the diameter of each of the following circles. The radius of each circle is given. Save your answers.*

1. 5 inches. **3.** 15 feet. **5.** 40 rods. **7.** 1 inch.
2. 3 feet. **4.** 10 miles. **6.** 100 yards. **8.** 1 mile.
9. 50 feet. **10.** 1 rod.

(*B*) *Using the diameters you have found, get the circumference of each circle. Save these answers also.*

(*C*) *Using the circumference that you got for each circle, find the area.*

Measuring Angles

Angles are measured in degrees. A **degree** is $\frac{1}{360}$ of a circumference. That is, a circumference equals 360 degrees, or 360°, as it is usually written.

It takes just one hour for the minute hand to pass around the dial of a clock or watch. The end of the minute

hand passes over the entire circumference of the dial once every hour. A clock has small divisions on the edge of its dial to indicate minutes, but it does not show marks for degrees. The circumference of the clock dial contains 360° because it is a complete circumference. The circumference of a watch dial also contains 360° for the same reason. All circumferences, whether large or small, contain 360°. The circumference of a dime contains 360° and so does the circumference of the earth.

The circumference of a clock or watch dial shows 60 minutes and contains 360 degrees. The ratio of the minutes to the degrees is 1 : 6. Every time one of the hands passes over a minute space on the circumference of a clock it has passed through 6°. Sometimes the hands of a clock are just together and sometimes they are 30 minute spaces apart. Since one minute space represents 6°, the ends of the hands are 180° apart when they are 30 minute spaces apart.

Subtract these numbers:

1	2	3	4
1.86 − .97 = ?	1.514 − .400 = ?	17.14 − 8.98 = ?	.1153 − .0970 = ?

5. A piano is listed at $1125 and sold at $1000. What is the per cent of discount?

6. Find the total of this bill:

15 ft. lamp cord at 3¢ per foot
1 50-watt lamp at 27¢
1 60-watt lamp at 30¢
2 15-watt lamps at 12½¢ each
2 25-watt lamps at 25¢ each
1 electric toaster at $8.75

Answer the following questions:

1. Find on your watch or clock the space which the minute hand passes over in one minute. How many degrees does this space represent?

2. How many degrees does the hour hand move through in one hour?

3. How many degrees does the minute hand move through in 20 minutes?

4. How many degrees does the minute hand move through in 30 minutes?

5. How many degrees does the minute hand move through in 45 minutes?

6. How many degrees are there between the minute hand and the hour hand at 3 o'clock?

7. How many degrees do perpendicular lines make with each other?

---

1. Jack Ralston wears out a pair of shoes in $3\frac{2}{3}$ months. At this rate how many pairs of shoes will Jack need in 3 years? How much will his shoes for 3 years cost at \$5.35 per pair?

2. When John Robinson was 21, his wages were increased from \$16 per week to \$21 per week. What per cent increase did John receive?

3. How many feet are there in .48 mile?

4. How many minutes are there in 9.4 hours?

5. How many pounds are there in 20.32 ounces?

6. How many gallons are there in 28.36 quarts?

8. How many degrees are there between the minute hand and the hour hand at 5 o'clock?

9. How many degrees are there between the minute hand and the hour hand at 8 o'clock if you measure the longer way around?

10. How many degrees are there in a right angle?

Finding the Surface of a Cylinder

A **cylinder** has a shape just like a well or a piece of pipe. The curved surface of a cylinder is called its **lateral surface.** The ends of a cylinder are circles. One of the ends is often called the base of the cylinder. **The area of the lateral surface is equal to the circumference of the base times the altitude.**

Problem. How many square feet are there in the lateral surface of a silo 10 feet in diameter and 20 feet high?

The circumference of the base of the silo is 3.1416 times its diameter.

$3.1416 \times 10 = 31.416$ $\qquad$ $31.416 \times 20 = 628.32$

Therefore the area of the lateral surface of the silo is 628.32 square feet.

Solve these problems:

1. How many square feet of sheet iron will be needed for a stove pipe 16 feet long and 6 inches in diameter, allowing 324 square inches additional for overlapping?

2. How much paint will be needed to paint the lateral surface of a silo 35 feet high and 9 feet in diameter if 1 gallon of paint is needed for every 350 square feet of surface?

3. How much sheet iron will be needed for a smoke pipe 10 feet long and 18 inches in diameter, allowing 500 square inches additional for overlapping?

4. How many square yards of cement will be needed for the inside of a cylindrical sewer 5 feet in diameter and $\frac{1}{2}$ mile long?

5. How many square feet of asbestos will be required to wrap 100 feet of steam pipe 2 inches in diameter?

6. A cylindrical tube is to be put under a highway for a culvert. The tube is 20 feet long. Its inside diameter is 36 inches and its outside diameter is 37 inches. How much paint will be needed to paint the curved surface of the tube inside and outside if 1 gallon of paint is enough for 300 square feet?

7. How many square inches of tin are needed for a pail 6 inches high and 5 inches in diameter? (Do not include the lid.)

8. How much paint will be needed to paint the sides of a pole 16 feet long with an average circumference of 20 inches if a gallon of paint is enough for 400 square feet?

9. How many square inches of tin are needed to make a cup 3 inches deep and 2.5 inches in diameter?

10. How much paint will be needed for 2 dozen fence posts each 5 feet high above the ground and each with an average diameter of 16 inches?

Practice Exercises

Find the quotients:

	(1)	(2)	(3)
(*A*)	$.86\overline{)214.64}$	$7.8\overline{)101.03}$	$.006\overline{).3162}$
(*B*)	$.00\overline{52)14}$	$8.5\overline{)3031.2}$	$.093\overline{)10.125}$
(*C*)	$.082\overline{)70.56}$	$.007\overline{).3416}$	$.87\overline{)102}$

1. Our class is planning to buy 48 yards of sateen for costumes in our pageant. What will the sateen cost at $45\frac{1}{2}$ cents a yard?

2. Find the amount of the bill for the following things:

2 lb. fruit cake at $42\frac{1}{2}¢$ per pound
1 lb. sliced baked ham at 75¢
1 bowl potato salad at 35¢
1 jar preserved oranges at $1.75
2 dozen cookies at 20¢ per dozen
1 bottle prepared mustard at 18¢

3. James Brock borrowed $37.00 from the bank for 60 days at 7% interest. How much interest will James have to pay?

4. Multiply 6940 by .037.

5. Mr. Barnes had $336. He bought and paid for five National Bank bonds at $50 each. How much money did he have left?

6. What part of $6\frac{2}{3}$ yards are $1\frac{2}{3}$ yards?

7. 50 miles are 25% of what number of miles?

8. How much is 6% discount on a bill for \$25.00?

9. Lake Monona had too many carp in it. Some men seined for the carp and put what they got in a large boat. Three men estimated the weight of the fish. The first man's

estimate was 850 pounds; the second man's estimate was 1585 pounds; the third man thought that there were 1927 pounds. The actual weight of the fish was 3263 pounds. Which man made the best estimate. How much better was his estimate than the poorest estimate?

10. A room had 5 windows. Three of them were 2 feet 6 inches by 6 feet 1 inch. The others were each 4 feet by 4 feet 5 inches. Find the total area of all the windows in square feet.

11. How many inches are there in .78 foot?

12. Change $\frac{5}{11}$ to a decimal.

13. How many feet are there in 7.8 yards?

Finding Volumes

We find the volume of anything by multiplying the length by the width and by the thickness. Other names for thickness are depth and height. Width is sometimes called breadth. All these dimensions must be alike before we multiply. That is, they must all be expressed in the same unit. Units of volume are all cubic units; that is, cubic inches, cubic feet, or cubic yards.

1. How many cubic feet of space are there in a room 32′ 6″ long, 24′ 4″ wide, and 11′ 8″ high?

2. How many cubic feet are there in a bin 12′ 3″ long, 10′ 6″ wide, and 5′ 9″ deep?

3. A trough is 6′ 4″ long, 2′ 6″ wide, and 18″ deep. How many cubic feet of water will it hold when it is full?

4. How many cubic inches are there in a piece of lumber 14′ long, 4″ wide, and $1\frac{1}{2}$″ thick?

Find the sums:

1	2	3	4	5
4.210	512.0	49.82	.3131	4.410
9.986	874.9	74.86	.5669	6.758
2.008	460.9	23.49	.7678	1.940
9.184	874.5	65.04	.2004	8.297
2.860	208.2	35.94	.5994	5.809
7.828	463.6	50.13	.9015	3.175
9.269	228.0	11.24	.1793	8.042
.654	134.9	34.04	.3700	.058

6. Mr. Simple lost 35% of his money last year on bad investments. What per cent of his money has he left?

5. How many cubic feet are there in a box that measures $2.5' \times 1.5' \times .5'$?

6. How many cubic yards of earth must be removed in making an excavation 32′ long, 20′ wide, and 3.5′ deep?

7. Mr. Jones has a tank that is $8\frac{1}{2}'$ long, $2\frac{1}{2}'$ wide, and $1\frac{1}{2}'$ deep. How many cubic feet of water are there in the tank when it is just half full?

8. How many cubic inches are there in a wooden box $6.5'' \times 4.25'' \times 2.75''$?

9. How many cubic feet of space are there in a cellar that is $10.5' \times 8.75' \times 6.5'$?

10. How many cubic feet are there in a box that measures $19.5'' \times 14.5'' \times 10.5''$?

Finding the Volume of a Cylinder

A cylinder has a shape like that of a well, a silo, or a piece of pipe. The base of a cylinder is a circle. The **volume of a cylinder is the area of its base multiplied by its altitude.**

Problem. How many cubic feet of space are there in a silo 30 feet high and 10 feet in diameter?

The circumference of the silo is 3.1416 times its diameter. $3.1416 \times 10 = 31.416$. Therefore the circumference of the silo is 31.416 feet.

The area of the base equals $\frac{1}{2}$ the circumference times the radius. If the diameter of the silo is 10 ft., its radius is 5 ft. $\frac{1}{2} \times 31.416 \times 5 = 78.54$. Therefore the area of the base is 78.54 square feet.

The volume of the silo is equal to the area of its base times its altitude. $78.54 \times 30 = 2356.2$. Therefore the volume of the silo is 2356.2 cubic feet.

Solve these problems:

1. How many cubic yards of gas will a tank 90 feet high and 45 feet in diameter hold when it is full?

2. A city water tank is 30 feet high and 18 feet in diameter. Counting 4.57 cubic feet to the barrel, how many barrels of water will the tank hold when it is full?

3. The Adams family have a water tank in their attic. The tank is 4 feet high and 4 feet in diameter. Counting 231 cubic inches to the gallon, how many gallons will the tank hold?

4. Sam Adams has to pump the water from the well into the tank by hand. A pipe 1 inch in diameter and 50 feet long connects the pump with the tank. How many gallons does Sam have to pump before the water begins to run into the tank?

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1. Our city park is 320 feet wide and 640 feet long. What are its dimensions in rods? What is its area in square rods?

2. If 3 pounds of bananas cost 25 cents, what is the cost of 10 pounds of bananas?

3. What is the cost of $27\frac{4}{9}$ yards of lace at $16\frac{2}{3}$ cents per yard?

4. Find $\frac{3}{16}$ of 16.4 pounds. Get the exact answer.

5. Find the product of $56920 \times .0059$.

6. What is the interest on \$200 at 8% for one year?

7. Which is larger, .087 or .078? How much larger?

5. A stone jar is 12 inches deep and 8 inches in diameter, inside measure. How many gallons will it hold?

6. Mary Wilson has a cup 3 inches deep and 2.5 inches across, inside measure. She bought it as a pint measure. Does it hold more or less than a pint? How much?

7. Mrs. Clark bought some berries from a neighbor. The berries were measured in a jar that was supposed to hold one gallon. The jar was 8 inches deep and 6 inches across on the inside. Did the jar hold more or less than a gallon? How much?

8. A cup is 4.5 inches deep and 3 inches across on the inside. Does it hold more or less than a quart?

9. A vessel is 14 inches deep and 18 inches across on the inside. Does it contain more or less than a half bushel? How much? (Count a bushel as 2150.4 cubic inches.)

10. How many cubic feet of wood are there in a pole 30 feet long with an average diameter of 8 inches?

Find the totals:

1	2	3	4	5
.9983	441.1	75.43	8.382	.6882
.5346	878.7	35.00	3.559	.9310
.2524	452.8	50.49	7.420	.6378
.6163	867.5	37.91	2.078	.3813
.2538	531.0	72.36	4.613	.7104
.6044	87.9	18.72	8.669	.3690
.4310	1.2	66.58	2.030	.1049
.0649	2.3	11.28	1.966	.1547

1. How many quarts are there in 7.2 gallons?

Drawing Plans and Maps

It is often necessary to draw a small picture of some area that is too large to picture in its actual size. Plans for houses, barns, city lots, and farms are things of this sort. A map also is a small picture of a large area. In order to make such pictures it is necessary to reduce each part of the original area. An inch on the plan will represent a certain number of feet, yards, rods, or miles in the original. You are to learn how to draw and read plans and maps. Before you can do so, however, you must be able to solve problems like the following. See if you can get them all right.

Problems

1. If 1 inch represents 20 miles, how many miles will $4\frac{1}{2}$ inches represent?

2. If 1 inch represents 20 miles, how many inches will it take to represent 475 miles?

3. If 1 inch represents 80 feet, how many inches will it take to represent 100 yards?

4. If 1 inch represents 80 feet, how many rods will $4\frac{1}{8}$ inches represent?

5. If 1 inch represents 16 rods, what will be the dimensions of a plan that represents a farm $\frac{1}{2}$ mile square?

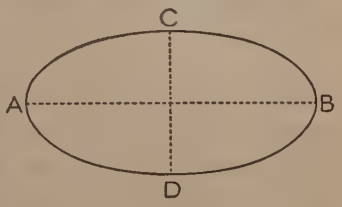
6. If 1 inch represents 16 rods, what part of a mile will $3\frac{3}{4}$ inches represent?

7. If 1 inch represents 25 yards, how many inches will it take to represent a race track 100 yards long?

8. The greatest distance across the United States from east to west is about 3300 miles. How many miles would an inch represent on a map that is $6\frac{3}{4}$ inches from east to west?

9. The longest distance north and south across the United States is about 1800 miles. How many inches up and down would the map mentioned in problem 8 have to be?

10. A race track has been constructed with a shape just like this picture. The line AB is just twice as long as line CD. The actual length of AB is $\frac{3}{4}$ mile. A plan is to be drawn of the track so as to make line AB 4 inches long. How many yards will an inch represent on this plan? How long will line CD be on the plan?



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1. Jane Harbert bought $21\frac{3}{4}$ yards of cheesecloth at $12\frac{1}{2}$ cents per yard to use for decorations on her porch. How much did the cheesecloth cost?

2. \$24.50 is how many times 25 cents?

3. Find $33\frac{1}{3}\%$ of 2000 pounds.

4. On an automobile trip Mr. Austin drove 315 miles in $9\frac{3}{4}$ hours. What was his average rate per hour?

5. How much must be paid for a student lamp which is listed at \$4.75 with 25% off?

6. In our village we are planning to have $3\frac{1}{2}$ acres in our athletic field, $2\frac{5}{8}$ acres in our playground, $2\frac{3}{16}$ acres in a park, and $3\frac{1}{4}$ acres in a schoolground. How many acres shall we need in all?

11. Mr. Jones wishes to build a house on his farm. The house is to face toward the south. The front part of the house is 32 feet long east and west, and 16 feet wide north and south. Take a sheet of paper and call the bottom of the sheet south. Draw a plan for the front part of Mr. Jones's house, allowing 1 inch to represent 8 feet and leaving 2 inches of space at the bottom of the sheet. Put two rooms of the same size on the ground floor in the front part. How many square feet will there be in each room?

12. Find the northeast corner of your diagram. Another porch 8 feet wide is to begin here and extend 28 feet straight north. The east edge of this porch is to be even with the east end of the front part of the house. How many inches will it take on your diagram to represent the length of this porch. What will be the area of the porch?

Find the differences:

1	2	3	4	5
.1163	18.67	.148	19.4	.0959
.0894	9.90	.099	9.9	.0590

6. Find the total amount of the bill for these bulbs:

2 dozen mixed tulips at 50¢ per dozen
$1\frac{1}{2}$ dozen white hyacinths at \$2.00 per dozen
$2\frac{1}{3}$ dozen pink hyacinths at \$1.50 per dozen
15 narcissuses at \$1.20 per dozen
3 lilies at 35¢ each

7. What is 5% commission on \$2500?

8. At 3.5 miles per hour, how long will it take to walk 9.45 miles?

13. Draw the plan for a porch 8 feet wide and 20 feet long in front of the house so that the east end of the porch will be just even with the east end of the house. How many inches will it take to represent the length of the porch? How many square feet will the porch contain?

14. Along the entire west edge of the porch Mr. Jones plans to have two more rooms each 14 feet square. Draw these on your diagram. How many inches will you use to represent 14 feet?

15. The kitchen is to be 14 feet by 16 feet. It joins the rest of the house on the north and is placed just even with the east edge of the porch with its longer side east and west. Put the kitchen on your diagram. What is the area of the kitchen?

16. All the house is two stories high except the kitchen. On another sheet of paper draw the plan for the upstairs rooms. Let 1 inch represent 8 feet.

Find the differences:

1	2	3	4	5
.0884	1.24	907.5	8.801	.934
.0420	.88	108.9	3.007	.099

6. What per cent of \$96 is \$6.66?

7. What per cent means the same as $\frac{4}{9}$?

8. How many feet are there in .9 mile?

9. Ruth had whooping cough all through September and 15 days in October. What part of the year was she sick with whooping cough?

The plan of Mr. Jones's barn is shown below.

17. How many square feet are there in the barn and sheds combined?

18. What is the area of the floor in the north shed?

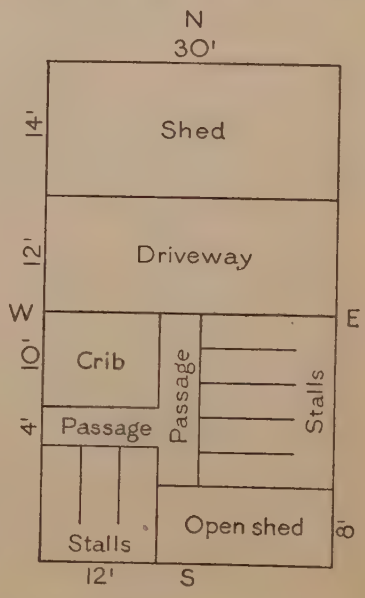
19. What is the area of the driveway?

20. How many square feet are there in the southwest stalls?

21. What is the area of the floor in the south shed?

22. What is the area of the floor of the crib?

23. How many square feet are there in both passageways taken together?



24. How many square feet are covered by the east stalls?

25. How many feet are there between the stalls in the east stable?

Find a map of the United States. Using the scale of miles given on the map, find the shortest distance in miles between each of these pairs of cities:

1. New York and Los Angeles.
2. Duluth and New Orleans.
3. Chicago and Key West, Florida.

4. Boston and Philadelphia.

5. Detroit and Washington.

6. St. Louis and Galveston.

7. Minneapolis and Kansas City.

8. Seattle and San Francisco.

Problems with Three or More Steps

Before you solve any one of these problems, read the problem over carefully, then write the letters that tell what you plan to do. Write "A" for addition, "S" for subtraction, "M" for multiplication, and "D" for division. Be sure to write the letters in the right order. The first one is marked correctly.

1. Mrs. Arnold bought 7 yards of silk for $1.98 a yard. She gave the clerk a 10-dollar bill and a 5-dollar bill. How much change should she receive? M A S

2. Apples are selling at 3 for 10 cents. At that rate, how much will $1\frac{1}{2}$ dozen apples cost?

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1. One pound of coffee makes 40 cups of coffee. How many pounds of coffee will be needed to make 75 cups of coffee?

2. Grace Lathrop had $1.25 in her pocket and lost 35 cents. What per cent of her money did Grace lose?

3. Mrs. Bowman bought $2\frac{1}{4}$ dozen eggs for $1.26. At that rate, what will 10 dozen eggs cost?

4. The enrollment in the Spring Valley School is 118 pupils. Yesterday 4.5% of the pupils were absent. How many pupils were present?

3. Mr. Barton bought 3 tons of coal for $12.75 a ton. He paid for it with four 10-dollar bills. How much change should he receive?

4. At 10 minutes of 4 Mary's mother said, "You may go out and play for three quarters of an hour." When will it be time for Mary to stop playing?

5. Dick started to town at a quarter past 8 and arrived in town at 25 minutes of 10. How long was Dick on the way?

6. Mrs. Adams bought $3\frac{1}{2}$ yards of wool at $1.75 a yard and $3\frac{1}{4}$ yards of percale at 18 cents a yard. How much did Mrs. Adams have to pay in all?

7. Mary Parker sells tickets at the motion-picture theater. Each day she takes $6.00 in change with her. She takes $\frac{1}{6}$ in nickels, $\frac{1}{3}$ in dimes, and $\frac{1}{2}$ in quarters. How many nickels does Mary take? How many dimes? How many quarters?

Find the quotients:

	(1)	(2)	(3)
(*A*)	$.97\overline{)5301}$	$.006\overline{).204}$	$4.8\overline{)20.08}$
(*B*)	$.075\overline{)41.52}$	$6.7\overline{)516}$	$.52\overline{)2.75}$
(*C*)	$6.8\overline{)610.14}$	$.033\overline{)1.011}$	$.93\overline{)64722}$

1. George Snyder had $1.13. He now has 66 cents. What per cent of his money is gone?

2. Grace Hilton wants a camera that costs $8.74. She has $6.75. How much more money does Grace need?

8. Which costs more, 1 ton of hard coal at $17.50 and 3 tons of soft coal at $10.50 per ton or 3 tons of hard coal?

9. John Carter started driving his car at 10 A.M. and had driven 150 miles by 3 P.M. How many miles per hour did he average?

10. Mr. Brown bought three lots without seeing them. Each of the lots was 200 feet square. When he went to see them he found all but 17500 square feet of the first lot under water, all but 25750 square feet of the second one on a steep rocky cliff, and all but 10000 square feet of the third one in a bog. How much undesirable land did Mr. Brown buy?

11. George Miller picks berries and sells them. Yesterday he sold 5 quarts at 24 cents each and 9 quarts at 19 cents each. What was the average price of his berries?

12. If it costs $18 to keep one horse for one year, how much will it cost to keep 24 horses 3 months?

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1. After school last week, Ned picked up potatoes every evening except Friday. On Monday he picked up 6 bushels 3 pecks; on Tuesday, 14 pecks; on Wednesday, $8\frac{1}{4}$ bushels; on Thursday, 7 bushels 2 pecks. He received 5 cents per bushel for all the potatoes that he picked up. How much did he earn in all?

2. On Saturday the meat shop had a sale. Mabel Grimes bought a roast marked $1.75 with $12\frac{1}{2}\%$ discount. She paid for the roast with a 2-dollar bill. How much change should she receive?

3. How many quarts are there in 7.8 pecks?

4. How many hours are there in 100 minutes?

13. Mrs. Bond bought 5 cans of peaches at 33 cents per can and an oil mop for 88 cents. She paid with a 5-dollar bill. How much change should she receive?

14. Mildred White bought 4 packages of hairpins at 12 cents per package and 3 packages of needles at 15 cents per package. How much did she have to pay in all?

15. In the auditorium of our school there are 17 rows of seats with 19 seats in a row, and 38 rows with 8 in a row. How many seats are there in all?

16. Mr. Olson wishes to set out 9 rows of apple trees with 15 trees in each row. He has 12 dozen trees. How many trees will be left over?

17. There are 250 pupils in our school. They want to have a school garden. They can get a piece of land from Mr. King which is $90' \times 60'$, but Mr. King wishes to reserve a portion $60' \times 20'$ for his own use. How many square feet may each pupil have if they use Mr. King's lot, provided all the pupils share equally?

18. If one gallon of paint covers 150 square feet, how many gallons of paint will be required to paint both sides of a fence $4\frac{1}{2}$ feet high and 40 rods long?

Subtract:

	(1)	(2)	(3)	(4)
(*A*)	$1.57-.98=?$	$.113-.097=?$	$83.1-13.4=?$	$.011-.007=?$
(*B*)	$60-56\frac{3}{4}=?$	$.406-.109=?$	$7.00-1.59=?$	$15.3-9.9=?$

1. Ruth Hyer saved $7.50 last year. What was her average per month?

2. How many pints are there in 5.23 quarts?

19. Harry Martin planted 24 hills of watermelons. He expected $87\frac{1}{2}\%$ of them to come up. Nineteen hills actually came up. Was this more or less than Harry expected? How much?

20. James, Ira, and Tom went together and bought a dozen apples for $1.20. James put in 20 cents, Ira put in 40 cents, and Tom put in 60 cents. How many apples should each boy get for his own?

21. Here are some of the prices charged at our laundry:

Shirts	18¢ each
Underwear	20¢ per suit
Socks	$7\frac{1}{2}$¢ per pair
Collars	5¢ each
Handkerchiefs	3¢ each

One week Dick sent 3 shirts, 2 suits of underwear, 2 pairs of socks, 4 collars, and 5 handkerchiefs. Make out Dick's bill and find out how much he should pay when he gets his laundry.

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1. John Walters broke his arm. His doctor's bill was $28.65. John plans to earn the money to pay this bill by selling papers. He buys the papers at $1\frac{1}{2}$ cents each and sells them at 3 cents apiece. How many papers must he sell in order to be able to pay his doctor's bill?

2. May Barton's older sister goes to college. It costs her $725 per year. She spends $200 for room rent, $237 for board, $45 for books and school supplies, $32 for fees, $50 for her sorority pledge, and the rest for incidentals. What per cent of her money does she spend for each of these items?

3. If a train travels 239.5 miles in 5 hours, how far should it go in $8\frac{3}{4}$ hours?

22. Mary Colby went out driving in her car today. She drove 32 miles between 1:45 P.M. and 3:00 P.M. How fast did she drive per hour?

23. The following are the telegraph rates (regular day rates) for any distance within 150 miles:

For the first 10 words	30¢
For each additional word	$2\frac{1}{2}$¢
For a night letter up to 50 words	30¢

How much would be saved by sending a message of 19 words by night letter rather than by the regular day rate?

24. James, Harry, and Dick went together and bought a dog to hunt with. James paid \$6, Harry paid \$8, and Dick paid \$10. They sold the dog later for \$27.00. How should they divide the money?

25. Harry Smith sells melons in town. Last Monday he sold 12 melons at 3 for \$1.00, 8 melons at 2 for 65 cents, and 6 melons at 3 for 85 cents. What was the average price of his melons?

26. James and his little brother want to buy a bicycle that costs \$24.00. James has offered to pay \$2.00 for every 1 dollar that his brother puts in. How much should each boy pay?

27. How much will it cost to pave the floor of a basement $24' \times 30'$ at \$2.25 per square yard?

28. John Markham and his father are taking a long drive in their car. They started from home at 8:45 in the morning. If they average 20 miles per hour, how far will they be from home at 6 P.M., allowing one hour out for lunch?

29. Let 1 inch stand for 30 feet. Draw the plan of a garden 75 feet long and wide enough to contain 10 equal parts each $30' \times 15'$.

30. How many pounds of food should a camping party of 4 grown people and 5 children take for a 7-day camp if each grown person requires $2\frac{1}{4}$ pounds per day and each child $1\frac{7}{8}$ pounds per day?

31. A grocer buys a dozen cans of fruit for \$3.50 and sells them at 50 cents a can. What is his per cent of gain?

32. Three ladies found a place where oranges were on sale by the bushel. They went together and bought \$8.75 worth. Mrs. A paid \$4.00, Mrs. B paid \$3.00, and Mrs. C paid \$1.75. What part of the oranges should each lady have?

33. How many hours and minutes in 45 minutes and 75 minutes?

34. A box is $1\frac{1}{2}$ feet long, $1\frac{1}{4}$ feet wide, and $6\frac{2}{3}$ inches deep. Does it hold more or less than one cubic foot? How much?

35. Grace Stark takes care of a baby for three quarters of an hour on Monday, Wednesday, and Friday, and for $1\frac{1}{2}$ hours on Tuesday, Thursday, and Saturday. She does not work on Sunday. What are her earnings for the week?

36. Find the volume of a trough $10\frac{1}{2}$ feet long, 9 inches wide, and 6 inches deep.

37. How many gallons of water are there in a cylindrical tank 5 feet in diameter and $2\frac{1}{2}$ feet high if the water is 9 inches deep? (Count a gallon as equivalent to 231 cubic inches.)

38. Sixteen people went camping. They took 400 pounds of food with them and expected to stay until their food ran out. They planned to use $2\frac{1}{2}$ pounds of food per person every day. After 5 days, 8 more people came who were not expected. The 8 people brought no food with them. No food could be bought anywhere. When must they plan to return if each person still eats $2\frac{1}{2}$ pounds of food per day?

39. Let 1 inch equal 80 feet. Draw the plot of a lot 50 feet wide and 150 feet deep.

40. Mary Wilson went shopping for her mother. She bought 3 cans of salmon at 25 cents a can and 4 yards of gingham 27 inches wide at 19 cents a yard. She paid with a 5-dollar bill. How much change should she receive?

41. How many blackberry bushes can be planted on $\frac{1}{8}$ of an acre if each bush requires a space $4' \times 2'$? (1 acre = 43560 sq. ft.)

42. Mrs. Kane bought $1\frac{1}{2}$ dozen linen handkerchiefs at the rate of 6 for \$1.75, one dozen linen napkins at 3 for 80 cents, and 6 towels at 2 for 75 cents. Find the total cost of her purchases.

43. One pound of sugar occupies $27\frac{1}{2}$ cubic inches. How many pounds of sugar will a can hold that is $3\frac{3}{4}'' \times 4\frac{1}{4}'' \times 5\frac{1}{2}''$?

44. One pint contains $28\frac{7}{8}$ cubic inches. A can is $2\frac{3}{4}''$ by $3\frac{1}{3}''$ by $3\frac{3}{4}''$. Does it contain more or less than a pint? How much?

45. Divide 20 pounds 5 ounces into 3 equal parts.

46. John Snyder needs 50 boards, each 2 feet 9 inches long, for a walk. He can buy the lumber in 12-foot, 14-foot, or 16-foot lengths. Which length will involve the least waste? How many boards of that length must he buy?

47. How many yards of material will it take to make 36 drapes for windows 4 feet 8 inches high, allowing 4 inches additional at the top and 16 inches additional at the bottom?

48. How many yards of fencing will be needed to inclose a lot $37\frac{1}{2}$ feet wide and $49\frac{1}{2}$ feet long?

49. How much space will be needed to plant 16 apple trees and 14 pear trees if each apple tree requires a space 20′ by 20′ and each pear tree a space 18′ by 18′?

50. At an average of 24 miles per hour, what part of a 180-mile trip will be covered in $3\frac{1}{4}$ hours?

51. It costs \$147.25 to wrap 7500 $\frac{1}{4}$-pound packages of butter and put them in boxes. The butter itself cost 35 cents a pound. How much per $\frac{1}{4}$-pound package must the butter bring in order to afford 25% profit?

52. If you buy at the rate of 8 for \$1.00 and sell at 20 cents each, what is the per cent of profit?

53. How many garden plots of 32 square feet each can be made from a piece of ground 12 yards square?

54. During July the amount of rainfall was $3\frac{1}{4}$ inches. Our garden is 30′ by 40′. How many gallons of water fell on our garden in July? (Count a gallon equivalent to 231 cubic inches.)

Review Exercises I

Find the differences:

1	2	3	4	5
4.783	.9874	18.41	733.1	.1292
1.007	.6009	8.53	485.9	.0710

6. What per cent is the same as $\frac{6}{7}$?

7. Ralph Baker sold 192 magazines in 6 weeks. At that rate, how many can he sell in 10 weeks?

8. What per cent of 140 marbles are 28 marbles?

9. Jane Pierce's father gave her a piece of ribbon $2\frac{1}{2}$ yards long from his store. How many badges $3\frac{1}{4}$ inches long can Jane make out of this ribbon?

10. The Rocky Ford football team made a total of 75 points against their opponents last year. This year they made a total which was 15 points higher. What per cent did they gain in total points?

11. Change $\frac{4}{9}$ to a decimal.

12. The total enrollment of the Rolling Green School was 125. Yesterday was a very cold day and 48 pupils were absent. What was the per cent of attendance yesterday?

13. How many pints are there in $31\frac{1}{4}$ quarts?

14. Mr. Norton bought $\frac{1}{2}$ dozen sweaters for \$48. At that rate, how many sweaters can he buy for \$216?

15. Our librarian has received \$22 to use in starting a new set of books. The volumes cost \$1.68 each. How many volumes can our librarian buy with the \$22?

Review Exercises II

Find the quotients:

	(1)	(2)	(3)
(*A*)	$.825\overline{)61.5024}$	$.36\overline{)270.207}$	$93.75\overline{)1315.36}$
(*B*)	$1.8\overline{)23.1534}$	$26\overline{)2315.34}$	$19\overline{)21.2203}$
(*C*)	$.068\overline{)6.12114}$	$1.8\overline{)111.522}$	$.39\overline{)202.05}$

Find the products:

1	2	3	4	5
8720	9.876	768.4	111	4320
.067	7.9	2.48	.579	.0234

6. If the grocery bill is $2.22 per week for 2 persons, about what should the grocery bill for 5 persons be?

7. How many handkerchiefs 11 inches square can be made from a yard and a half of linen which is 36 inches wide? Allow $\frac{1}{2}$ inch on each side for the hem.

8. A couch was placed on sale for $113.20. The original price of the couch was $224. What was the per cent of discount?

9. Harry West bought 4 pet rabbits for $10.00. At that rate, what should 7 rabbits be worth?

10. If Mr. Clark can drive his horses 22.4 miles in 4 hours, how far should he be able to drive in 9 hours of driving time?

11. How long would it take to fly 568.6 miles at an average rate of 82 miles per hour?

Review Exercises III

Subtract these numbers:

	(1)	(2)	(3)
(*A*)	$.942 - .495 = ?$	$8.903 - 6.004 = ?$	$86.67 - 60.99 = ?$
(*B*)	$.1367 - .0999 = ?$	$945.2 - 300.3 = ?$	$.721 - .193 = ?$

1. A real-estate agent sold a house and lot for $8453. The commission was $4\frac{1}{4}\%$. How much money did the agent receive?

2. Twenty-four long logs can be put on a flat car with 8 logs in a layer. How many layers will be needed if 72 logs are to be loaded on the car?

3. How many pounds are there in $\frac{5}{6}$ of a ton?

4. $1512 \div 2.4 = ?$

5. How many gallons are there in 10.6 quarts?

6. How many rods are there in 421 yards?

7. How many feet are there in .92 mile?

8. How many pounds are there in 102.4 ounces?

9. How many gallon jugs will it take to hold $30\frac{1}{2}$ quarts of cider?

10. How many quarts are there in 6.72 pecks?

11. How many yards are there in 111 feet?

12. Find the amount of this bill:

1 box talcum powder at 18¢
$\frac{1}{2}$ dozen bath towels at 40¢ each
1 pair shoe trees at 25¢
3 tooth brushes at 25¢ each
1 mirror at $1.98

Review Exercises IV

Find the sums:

1	2	3	4	5
5.857	943.7	.8735	97.85	9.897
7.458	483.8	.1778	50.66	1.379
5.840	879.5	.9101	24.00	2.900
6.089	136.1	.6988	40.99	8.099
4.616	648.0	.2052	77.10	1.902
4.380	324.9	.8927	87.89	9.097
2.018	20.7	.1070	1.01	1.700
.741	45.2	.1148	9.19	4.015

Find the remainders:

6	7	8	9	10
.612	.1464	91.1	1.56	.1897
.256	.0665	67.7	.88	.0998

11. The Midland basket-ball team lost all but $33\frac{1}{3}\%$ of their games. What per cent of their games did they lose?

12. How many square inches are there in a piece of cloth $1\frac{1}{4}$ feet square?

13. A merchant bought 9 gross of pencils for \$51.84. At this rate, what would 15 gross of pencils cost?

14. Grandma Perkins is making a quilt. The quilt is to be made in 10-inch squares. It is to be 9 squares long and 6 squares wide. What will be the dimensions of the quilt? How many square feet will the quilt contain?

15. How many dollars are $\frac{5}{6}$ of \$3.42?

16. Ninety-six knives are what part of a gross?

Review Exercises V

Find the differences:

1	2	3	4	5
\$645.33	\$914.63	\$992.32	\$707.52	.1497
269.32	466.98	202.35	409.87	.0555

Find the products:

6	7	8	9	10
968.7	534.20	9.467	89200	86.31
4.9	3.05	86.2	.46	56.8

11. Baby Jane weighed $6\frac{3}{4}$ pounds at birth. She weighed $7\frac{1}{8}$ pounds when she was one month old. How much did Baby Jane gain during the first month?

12. Multiply 658.93 by .59.

13. Norman's father paid \$20.48 for 8 pairs of skates to sell in his store. What will 11 pairs of skates cost at this rate?

14. Which is cheaper, to buy a coat listed at \$89 with a 20% discount or to buy a coat equally good which has been marked down to \$68? How much cheaper?

15. John Toy is $21\frac{1}{4}$ years old. His sister Grace is $18\frac{2}{3}$ years old. Find the difference in their ages.

16. What is $6\frac{1}{4}\%$ of 160 pounds?

17. The children of the Prairie View School made \$37.00 on their candy sale, \$31.69 on their play, and \$27.00 on their concert. How much did they make in all?

18. If 36 pairs of shoes cost \$282.24, what will 25 pairs of shoes cost?

Review Exercises VI

Find the quotients:

	(1)	(2)	(3)	(4)
(*A*)	$.92\overline{)4012.01}$	$26\overline{)40.8186}$	$18\overline{)310.136}$	$2.5\overline{)3510.46}$
(*B*)	$.39\overline{)61.1019}$	$.024\overline{)24.6876}$	$8.5\overline{)512.408}$	$.038\overline{)1.1736}$

1. At the rate of $6\frac{1}{4}$ miles per hour, how many hours of driving time will be required to drive a horse $101\frac{1}{3}$ miles?

2. Mr. Conway took 5 hogs to market in a wagon. The gross weight was 3014 pounds. The tare was 1175 pounds. What was the net weight of the hogs?

3. Find $3\frac{3}{4}\%$ of \$5000.

4. Each of the teacups at the Mt. Olivet Church holds just $\frac{1}{3}$ of a pint. How many quarts of milk will be needed to serve each of 50 children with a teacupful of milk at the church dinner next Saturday?

5. What is the total amount of the discount on a bill of \$1820 which is marked 20, 10, and 5 off?

6. The Ladies' Aid Club made the following amounts at their sale yesterday: on flowers, \$3.40; on candy, \$9.97; on cider, \$6.50; on eggs, \$8.29; on fruit, \$9.47. How much did they make all together?

7. What part of 104 is 4?

8. John Weston is driving his car on a long trip. Day before yesterday he drove 302.6 miles; yesterday, 160.4 miles; today he has driven 304.5 miles. How many miles has John driven in all?

Review Exercises VII

Find the differences:

1	2	3	4	5
1.0426	19.74	743.1	.0682	6729.1
.3037	9.95	199.3	.0226	1033.7

6. Find the sum of $335, $896, $494, and $482.

7. What is the average rate of driving speed of a man who drives $151\frac{1}{2}$ miles in $5\frac{3}{4}$ hours?

8. $27\frac{3}{4}$ is 37% of what number?

9. Multiply 9674 by .0593.

10. Elizabeth Rand takes care of a neighbor's children for a while every day. This is the record of her time for last week: Monday, $3\frac{3}{4}$ hr.; Tuesday, $1\frac{2}{3}$ hr.; Wednesday, $1\frac{2}{3}$ hr.; Thursday, $1\frac{1}{4}$ hr.; Friday, $\frac{5}{6}$ hr.; Saturday, $\frac{5}{6}$ hr.; Sunday, $3\frac{1}{6}$ hr. How many hours did Elizabeth spend in all?

11. How much should Elizabeth receive at 25 cents an hour for her work last week?

12. If 2 dozen rolls are required to serve 8 persons, how many rolls will be needed to serve 45 persons?

13. How many persons will 45 rolls serve?

14. What part of 81 is $31\frac{1}{2}$?

15. $\frac{7}{8}$ means the same as what per cent?

16. At 5.9 miles per hour, how far should a horse go in 7.75 hours of driving time?

Review Exercises VIII

Find the quotients:

	(1)	(2)	(3)
(*A*)	$.343 \div .007 = ?$	$14.1216 \div .028 = ?$	$3.753 \div .75 = ?$
(*B*)	$73132.8 \div 8.8 = ?$	$201.121 \div .49 = ?$	$2.0209 \div .037 = ?$
(*C*)	$1.3752 \div 180 = ?$	$23.2 \div .8755 = ?$	$23.633 \div 7500 = ?$

1. Find the amount of this bill:

1 overcoat at $44.59
6 boys' tweed suits at $12.82 each
12 woolen scarfs at $2.20 each
$1\frac{1}{2}$ dozen shirts at $2.15 per shirt
2 men's suits at $42.92 each

2. Make a drawing to represent a yard 21 feet long by $17\frac{1}{2}$ feet. Let 1 inch equal 7 feet.

3. Which is smaller, $640 - 480$ or $640 - 503$? How much smaller?

4. Mr. Owens had $9.22 in his pocket when he went uptown. When he got home he had $3.58. He is quite sure that he has not lost any money and that he has bought nothing but one hat. What per cent of what he had did he pay for the hat?

5. Change $\frac{1}{16}$ to a decimal.

6. If one pair of shoes costs $5.85, how many pairs of such shoes can a person buy for $52.65?

7. William Anderson gave his little sister 17 cents, his little brother 6 cents, his older sister 33 cents. He then had 3 cents left. How much money did William have at first?

Review Exercises IX

Subtract these numbers:

	(1)	(2)	(3)
(*A*)	$.0643 - .0267 = ?$	$1.32 - .77 = ?$	$12.1 - 8.8 = ?$
(*B*)	$8.46 - 3.11 = ?$	$.1339 - .0542 = ?$	$26.0 - 22.2 = ?$

Find the products:

1	2	3	4
95210	96.32	8.632	.9768
78.9	617	237	810

5. An agent sold 500 pounds of butter at 50 cents a pound. He received $2\frac{2}{3}$ cents per pound as commission. What was the amount of his commission on this sale?

6. If 50 bushels of apples weigh $1\frac{1}{2}$ tons, how many tons will 278.3 bushels weigh?

7. What is the amount of the annual income from \$13,000 invested at 6% and \$1500 invested at $6\frac{1}{2}$%?

8. How many pints are there in 3.6 quarts?

9. If Edgar Baldwin can save \$4.50 in six weeks, how much should he be able to save in 52 weeks?

10. At a fire sale a chair which cost \$9.00 was sold for \$3.00. What was the per cent of loss?

11. How many quarts are there in .78 gallon?

12. The total enrollment of the Token Creek School is 69. The number absent today is 9. What is the per cent of attendance for today?

Review Exercises X

Find the quotients to two decimal places:

	(1)	(2)	(3)	(4)
(*A*)	$875\overline{)6}$	$750\overline{)28.35}$	$4375\overline{)1604}$	$9275\overline{)228.201}$
(*B*)	$3750\overline{)228}$	$1875\overline{)551}$	$.1625\overline{)8}$	$8225\overline{)542}$

Find the sums:

1	2	3	4	5
5331	4322	2121	4043	5422
9898	7659	8337	3507	8929
4904	4970	7512	9511	7252
2046	8434	3368	3879	3499
9171	8078	2557	4674	1407
526	1707	8231	5213	3022
1	3616	1802	2687	1371
1699	180	3757	6262	1004

6. Mrs. Rainey bought 2 pairs of gloves at $3.00 each with a discount of 20%. She paid with a check for $13.32. How much change should she receive?

7. How many feet are there in 9.6 inches?

8. If toy whistles are selling at 16 for a dollar, how much will 2 dozen of the whistles cost?

9. Eighty-four is how many times $2\frac{1}{4}$?

10. Mrs. Arnold bought 5 yards of ribbon for sashes for Mary and Jean. Mrs. Arnold used 2 yards and 4 inches for Mary's sash. How much ribbon was left for Jean's sash?

Review Exercises XI

Find the sums:

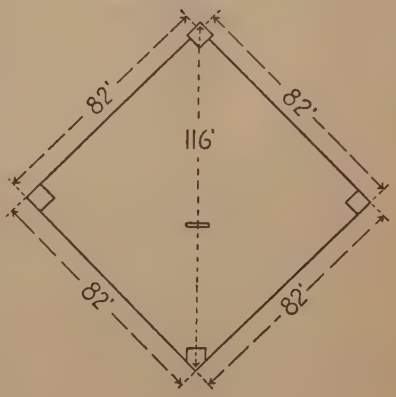
1	2	3	4	5
789.6	.5653	94.53	2.530	.5333
431.7	.9879	53.86	3.697	.3865
683.5	.4535	19.00	7.009	.9108
587.1	.1523	60.89	2.985	.1799
402.5	.7470	59.33	9.130	.7060
622.7	.8538	11.94	1.979	.3907
132.1	.0060	89.08	8.402	.6760
58.4	.0037	10.36	4.057	.1136

6. Mr. Bruce allows a 35% margin. What per cent of his selling price must the cost of his goods be?

7. How many square yards are there in a field that is 80 rods long and 28 rods wide?

8. A storekeeper bought 20 pairs of gloves for $41.60. At this rate what should 35 pairs of gloves cost?

9. Find the area of the baseball diamond which is here drawn.



10. How much is $\frac{5}{8}$ of $5.76?

11. Find the product of $5831 \times .0089$.

12. What part of a mile are 2310 feet?

13. What is 4% of $2500?

Review Exercises XII

Find the differences:

1	2	3	4	5
.154	17.82	.1131	9856.1	.524
.087	9.98	.0998	4089.4	.276

6. Carol Markham spent 10 cents for a box of Christmas seals, $1.98 for a pair of silk hose, $5.53 for three books, $1.86 for postage, and $4.98 for games, handkerchiefs, and Christmas cards. How much did Carol spend in all?

7. Kate Marshall made 5 dozen cookies which cost her 60 cents. She sold the cookies for $1.20. What per cent of profit did Kate receive?

8. How many pigs' feet can you buy for 75 cents at the rate of 2 for 15 cents?

9. How much commission does Mr. Barnes get on a sale of $6250 if the rate of his commission is 5%?

10. If 50 pairs of shoes can be bought for $300, how many pairs of shoes can be bought for $175?

11. The list price on a school dress was $6.90. The discount was $1.30. What was the per cent of discount?

12. How many minutes are there in 1.4 hours?

13. Change $\frac{1}{24}$ to a decimal.

14. If 6 rugs cost $78.60, what will 11 rugs cost?

15. Find the cost of 1200 pounds of hay at $18 a ton.

16. Find the cost of $3\frac{3}{4}$ pounds of butter at 49¢ a pound.

Review Exercises XIII

Find the quotients to two places of decimals:

	(1)	(2)	(3)	(4)
(*A*)	$900\overline{)201.015}$	$483\overline{)200.104}$	$.65\overline{)11.0106}$	$.082\overline{)10.0016}$
(*B*)	$750\overline{)31.2312}$	$9275\overline{)502.011}$	$875\overline{)48.0232}$	$38\overline{)60.9123}$

1. Find the total of this bill:

2 50-watt electric lamps at $.54 each
6 10-watt electric lamps at $.25 each
1 reading lamp at $4.76
1 washing machine at $147.25
1 electric pad at $4.75

2. Mr. Grimes and Mr. Clark estimated the weight of a pile of apples. Mr. Grimes's estimate was $\frac{7}{8}$ of a ton, Mr. Clark's was $\frac{9}{16}$ of a ton. The apples weighed $1\frac{1}{4}$ tons when taken to market. Which man's estimate was better? How much better?

3. How many pounds of fish will be required to serve 250 people if each person receives 5 ounces of fish?

4. How many quarts are there in $6\frac{3}{4}$ gallons?

5. How many square rods are there in 6.92 acres?

6. Find the volume of a box that is 3.5 feet long, 1.75 feet wide, and 1.5 feet deep.

7. James Grimes jumped 12 feet 6 inches. Robert Morris jumped 10 feet 8 inches. Which boy jumped farther? How much farther?

8. Find $16\frac{2}{3}\%$ of 216 acres.

9. What per cent of 1728 is 576?

Review Exercises XIV

Find the differences:

1	2	3	4	5
1.2115	3.403	99.31	153.3	.0911
.4039	1.009	53.50	99.4	.0696

6. A real-estate agent sold a house and lot for $8542.50. His commission was 5% on the first $5000 and 3% on the remainder. What was the total amount of his commission?

7. What is the amount of the discount on a bill for $1850 when the rate of discount is 15%?

8. What per cent means the same as $\frac{8}{25}$?

9. $8\frac{7}{8}$ is 75% of what number?

10. What per cent of 64 is 56?

11. At 5.43 miles per hour how long will it take to drive 301 miles?

12. Brooklyn Bridge is $1996\frac{1}{3}$ yards long. How many feet are there in $1996\frac{1}{3}$ yards?

13. The area of a lot is 964 square yards. How many square rods are there in the lot?

14. How many quarts are there in 3.4 gallons?

15. A dealer paid $164.19 for a number of school bags. The cost of the bags was 39¢ each. How many bags did the dealer buy?

16. How many 6-inch badges can be made from a yard and a half of ribbon?

17. $9996 \div 98 = ?$

Review Exercises XV

Find the totals:

1	2	3	4
798.0	.9874	543.9	7.89
374.3	.8677	567.4	5.78
914.7	.2027	746.2	5.22
398.8	.8761	363.6	96.14
141.0	.4037	601.4	76.65
519.8	.1860	589.5	.24
222.2	.2109	203.0	.09
520.7	.1143	380.5	.96

5. Mary Carson had $7.42. She has spent all her money except $2.97. What per cent of her money has she left?

6. The enrollment of the Roosevelt School is 215 pupils. Today the per cent of attendance was 86.2%. How many pupils were absent?

7. What is the weight of $8\frac{3}{4}$ bushels of dried apples if one bushel of dried apples weighs 26 pounds?

8. How many miles are there in 10560 feet?

9. How many pints are there in .875 quart?

10. Multiply 78.92 by 8.79.

11. How many gallons are there in 16.4 quarts?

TABLES OF MEASURES

Long Measure

12 inches (in.) = 1 foot (ft.)
3 feet = 1 yard (yd.)
$5\frac{1}{2}$ yards = 1 rod (rd.)
320 rods = 1 mile (mi.)
5280 feet = 1 mile
$1\frac{1}{6}$ miles = 1 knot

Square Measure

144 square inches (sq. in.) = 1 square foot (sq. ft.)
9 square feet = 1 square yard (sq. yd.)
$30\frac{1}{4}$ square yards = 1 square rod (sq. rd.)
160 square rods = 1 acre (A.)
640 acres = 1 square mile (sq. mi.)
36 square miles = 1 township

A square mile is also called a section.
A square in connection with shingling = 100 square feet.

Cubic Measure

1728 cubic inches (cu. in.) = 1 cubic foot (cu. ft.)
27 cubic feet = 1 cubic yard (cu. yd.)

A cord is 128 cubic feet.
A perch is $24\frac{3}{4}$ cubic feet.

Circular Measure

60 seconds (″) = 1 minute (′)
60 minutes = 1 degree (°)
A right angle = 90°
A circumference = 360°

Liquid Measure

2 pints (pt.) = 1 quart (qt.)
4 quarts = 1 gallon (gal.)
$31\frac{1}{2}$ gallons = 1 standard barrel

Dry Measure

2 pints = 1 quart (qt.)
8 quarts = 1 peck (pk.)
4 pecks = 1 bushel (bu.)

Measures of Weight

16 ounces (oz.) = 1 pound (lb.)
100 pounds = 1 hundredweight (cwt.)
2000 pounds = 1 short ton (T.)
2240 pounds = 1 long ton

Measures of Time

60 seconds (sec.) = 1 minute (min.)
60 minutes = 1 hour (hr.)
24 hours = 1 day (da.)
7 days = 1 week (wk.)
30 days = 1 business month (mo.)
12 months = 1 year (yr.)
360 days = 1 business year
365 days = 1 common year
366 days = 1 leap year

If the number of a year is divisible by 4, the year is usually a leap year. For even centuries the number of the year must be divisible by 400 to make a leap year.

The Months

January (Jan.) has 31 days.
February (Feb.) has 28 days if it is not a leap year. February has 29 days in leap years.
March (Mar.) has 31 days.
April (Apr.) has 30 days.
May has 31 days.
June has 30 days.
July has 31 days.
August (Aug.) has 31 days.
September (Sept.) has 30 days.
October (Oct.) has 31 days.
November (Nov.) has 30 days.
December (Dec.) has 31 days.

United States Money

10 mills = 1 cent (¢)
10 cents = 1 dime (d.)
10 dimes = 1 dollar ($)
25 cents = 1 quarter

Miscellaneous Measures and Facts

12 units make 1 dozen (doz.).
12 dozen make 1 gross (gro.).
1 gallon occupies 231 cubic inches.
1 bushel occupies 2150.4 cubic inches, or 1.244 cubic feet.
1 cubic foot contains about $7\frac{1}{2}$ gallons.
1 cubic foot of water weighs $62\frac{1}{2}$ pounds.
1 bushel of wheat weighs 60 pounds.
1 bushel of rye weighs 56 pounds.
1 bushel of oats weighs 32 pounds.*
1 bushel of barley weighs 48 pounds.*
1 bushel of shelled corn weighs 56 pounds.*
1 bushel of white potatoes weighs 60 pounds.*
1 bushel of beans weighs 60 pounds.*
1 bushel of apples weighs about 48 pounds.*
1 bushel of buckwheat weighs 48 pounds.*
1 bushel of millet seed weighs 50 pounds.
1 bushel of timothy seed weighs about 45 pounds.*
1 bushel of clover seed weighs 60 pounds.*
1 bale of cotton weighs 500 pounds.

Paper

24 sheets = 1 quire
20 quires = 1 ream

* The weights here given are those accepted in most states.

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